House Beautiful Building Annual 1926



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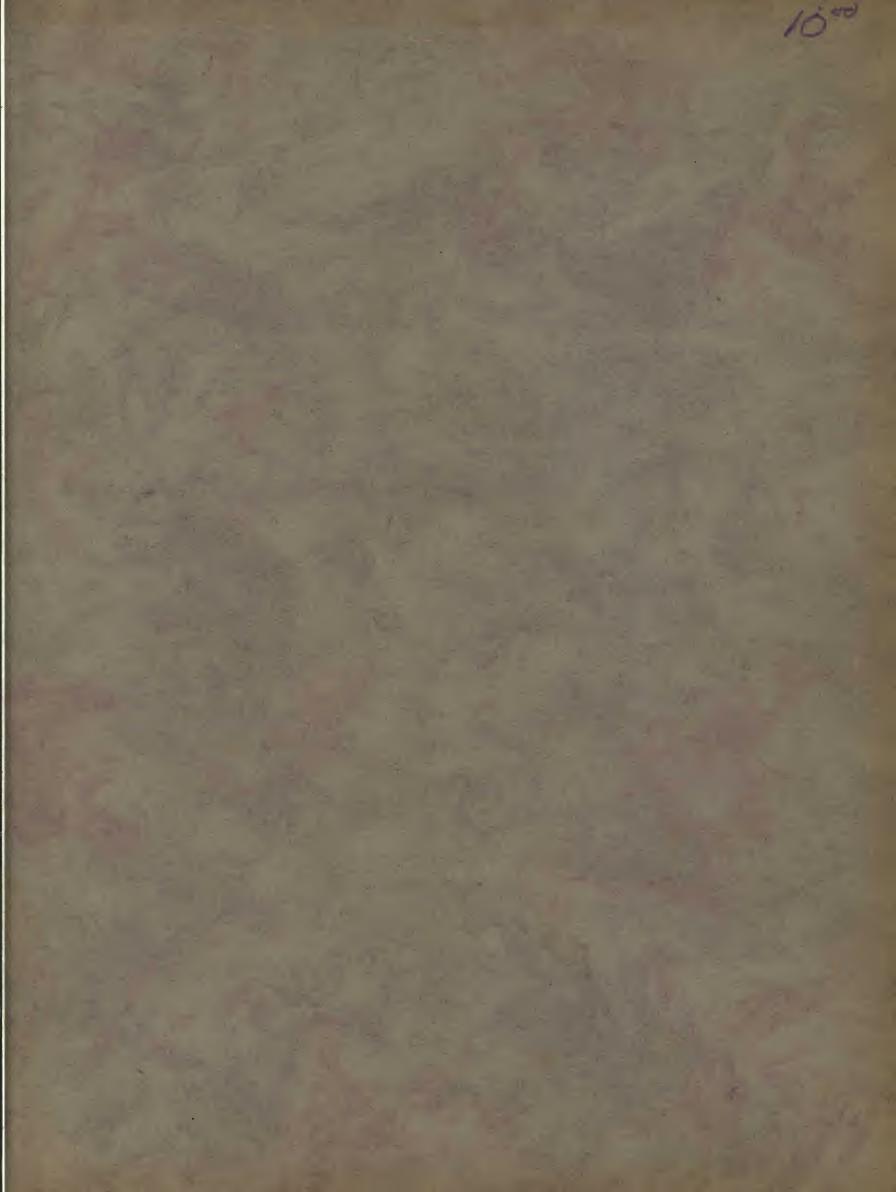
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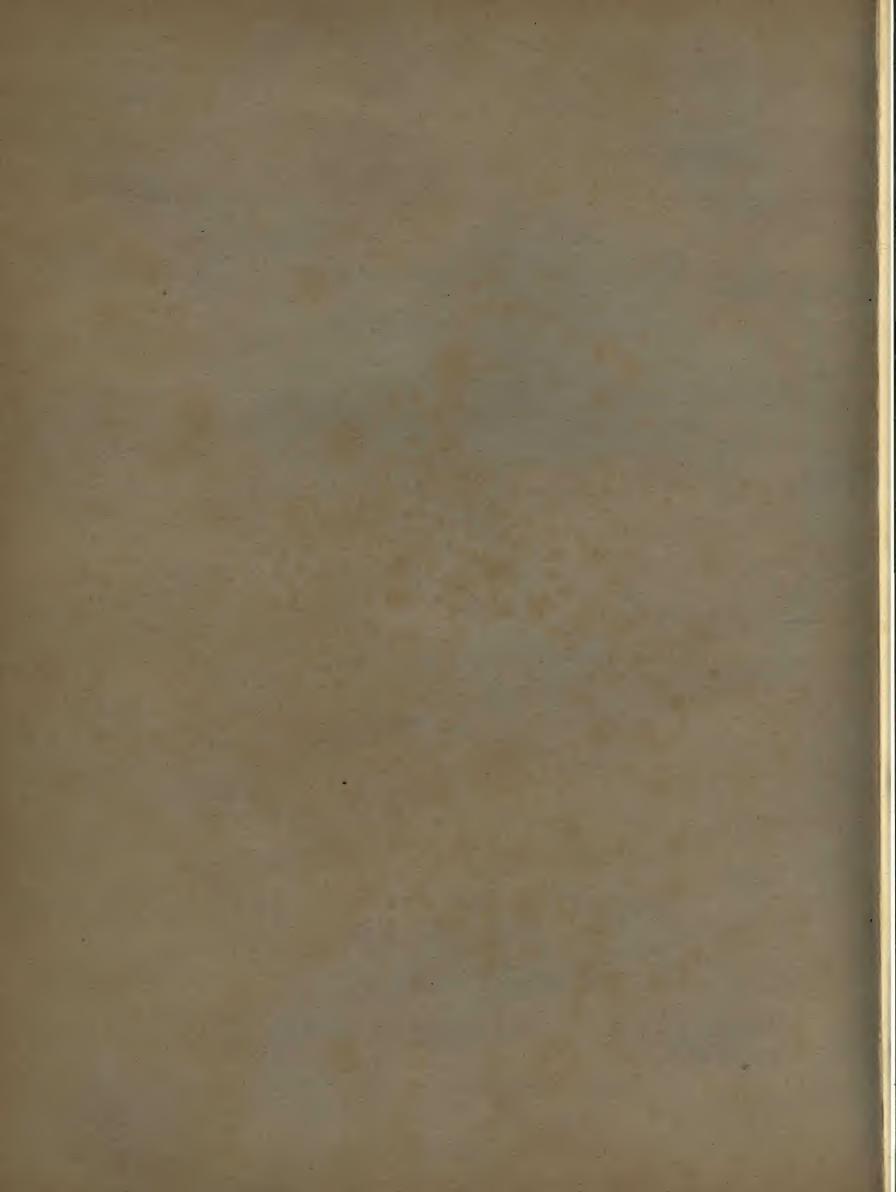
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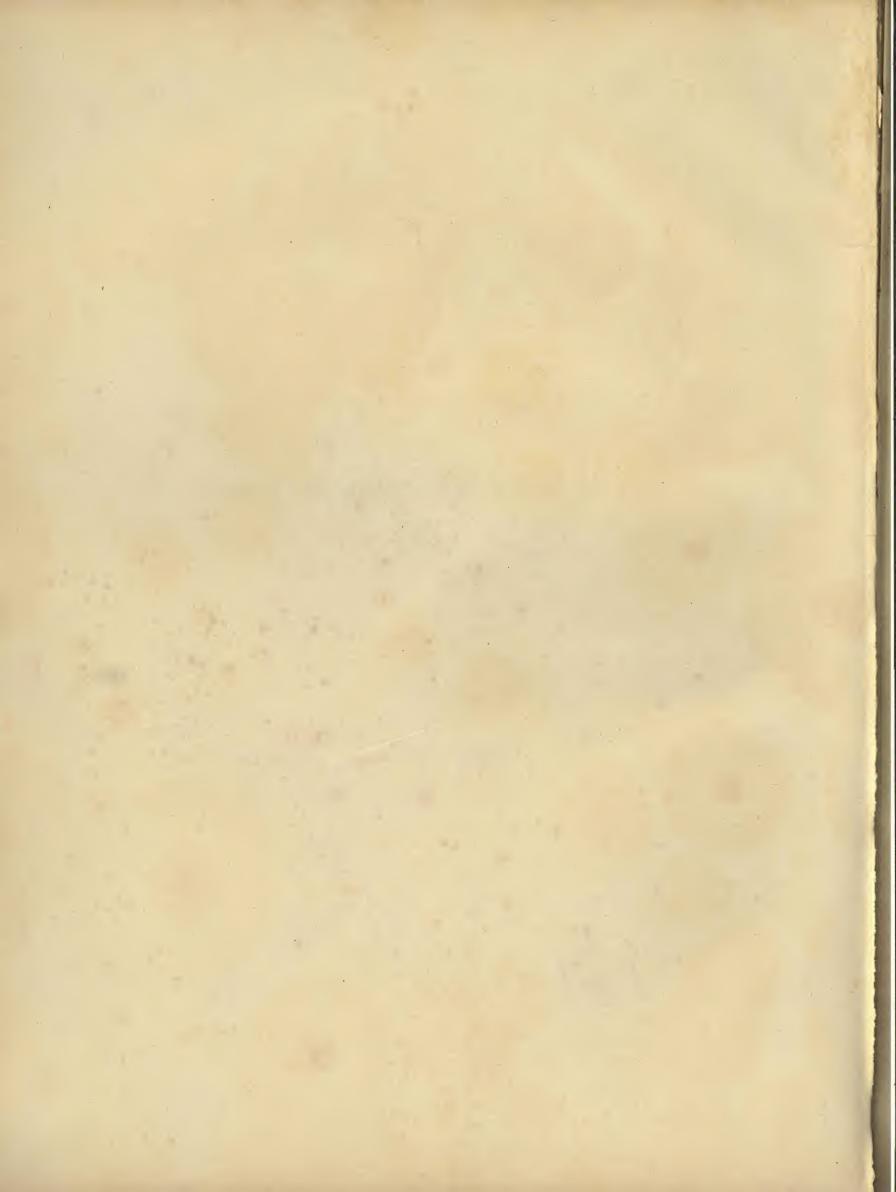
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# 1926

A COMPREHENSIVE AND PRACTICAL MANUAL OF PROCEDURE, MATERIALS, AND METHODS OF CONSTRUCTION FOR ALL WHO CONTEMPLATE BUILDING OR REMODELING A HOME

A Thorough Revision of the 1925 Edition with Important Additions



Profusely illustrated with photographs detailed drawings and plans

THE ATLANTIC MONTHLY COMPANY
BOSTON

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# PREFACE

This Annual is prepared as a source of useful information for home-builders. It supplements, but does not supplant, the architect. It is designed to help the layman understand in solid terms of brick and mortar, of framing and plaster, of dollars and cents, just what plans mean, and, when construction begins, to enable him to follow the progress of the work. With its help, he can discuss his problems intelligently with architect and contractor, and by applying its information he will, it is hoped, save both mistakes and money.

There is no pretense that this is an encyclopædia. It treats the usual conditions which are met and the usual materials employed. Nor does the Annual deal with the infinite variety of styles appropriate to house-building. It is not an index to Period architecture. It does aim to give anyone planning to build an adequate opinion of the comparative desirability of materials for obtaining given effects, of their relative cost and wearing qualities, and of the approved methods of construction.

The experienced know, the inexperienced can scarcely imagine, the endless series of problems, little and big, which must be solved before the new home is designed, contracted for, supervised, finished, and paid for. The sequence in which these problems arise has been followed in these pages by chapters on the architect, the contractor, the contract, the cost, and the materials used.

If there is one piece of advice rather than another serviceable to a prospective home-builder, it is Plan, Plan, Plan! Pencils and paper are cheap. Materials and labor are not. Even before you visit your architect, draw, however imperfectly, your own sketch plan. Consider your family needs. Remember in detail all the comforts and conveniences you have ever hoped for. When the estimates come in, you may lose, one by one, the "features" you covet, but there is always a chance for them if only they are remembered in time. And after you take your first rough ideas to the architect, and he has translated your clumsy sketches into orderly blueprints, go freshly over every detail. Discuss the position of every piece of furniture you own. Trace the steps from kitchen to front door. Can they be made less? How far is the stove from everything the cook needs? Can the soup be brought hot to the dining-table? Are there cross-drafts in the bedrooms, and headroom over the cellar stairs? Are the coal-bins ample? Is the plumbing so stacked as to use the utmost economy? There are a thousand questions of comfort and convenience and expense in every plan, and a thousand more in every set of specifications.

To assist the interpretation of ideals of use and beauty into terms of building materials, to familiarize the inexperienced home-builder with the "customs of the trade," and to prescribe the ounce of prevention which may forestall the pound of cure is the purpose of this Annual.

The publishers of this Annual, at their home offices in Boston, maintain a corps of experts who are equipped to answer any questions not covered in its pages. A statement of the character of these services and the conditions under which they can be rendered may be had on application.

We thank the public for the warm-hearted reception given to this Annual on its appearance as a pioneer work, and only regret that the impression of twenty-five thousand copies fell far short of satisfying the demand. In this new edition, which has been comprehensively rewritten, reëdited, and reillustrated, we have incorporated a great number of fresh suggestions, and trust that in its improved form the Annual will meet the needs and wishes of all who plan new houses, or feel the desire of making old ones more perfectly adapted to their needs, their comfort, and their dearest hopes. Our thanks are especially due to Charles G. Loring, who edited the Annual for 1925 and to whose able editorship the original edition owes so much.

THE ATLANTIC MONTHLY COMPANY



Dignity and Hospitality

The happy combination in this house of the formal dignity of Georgian architecture and easy hospitality, expressed by the more informal entrance path and border of flowers, makes it a satisfying expression of the best type of American life. Designed for William K. Jackson, Esquire, by Henry A. Frost and Eleanor Raymond, Architects



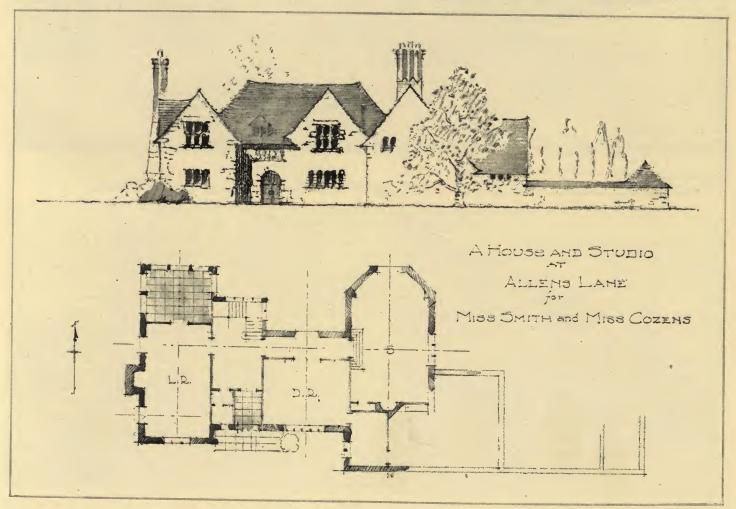
I

# THE ARCHITECT

THE employment of a professional adviser has been proved of value both economically and æsthetically.

Financially, the architect should be able to save his fee to the owner by suggesting economies in planning, in construction, and in the use of the materials which will not detract from the essential requirements. This is due to his experience in handling similar work and his training and familiarity with the building-market. Some of the simplest examples are in the grouping of flues to save chimneys; the placing of the plumbing fixtures on the different floors so as to save piping for supplies, wastes, and vents; and specifying those materials which are most available or wear best under local conditions.

From the artistic point of view, either the architect should recommend to the owner the type of design best suited to the individual and the locality, or, if the owner has already



Preliminary Sketch

Architects choose different media for their preliminary sketches. This rendering in pencil by Edmund B. Gilchrist is sufficiently definite to indicate the character of the house and yet flexible enough to permit considerable leeway in the working out of detail



Perspective Sketch

A sketch that shows perspective or three dimensions is undoubtedly more comprehensible to the average client. This rendering in pencil, from the office of Treanor and Fatio, gives a very definite idea of the proportions of the house and its adaptation to the hillside site

determined in his own mind the character of the house to be erected, he should be able to point out and eliminate defects, and at the same time further develop the individuality to be expressed, and emphasize the attractive features. His assistance in this case is particularly valuable, for from flat drawings he can visualize the house that is to be built; he feels the relationship of plans and elevations and so does not unwittingly place a second-story fireplace over the middle of the parlor ceiling, or make similarly awkward arrangements. He can analyze the special effect of age or richness his client desires, and advise how it may be produced by some small change in surface texture or by modulation of color. The width of a stone joint, or a slight change in the proportions of a wood stair may signify as wide a difference between the best and "good enough" as between a Corot and a chromo.

#### **SELECTION**

In selecting the architect, both his artistic qualifications and his business ability must be considered. The best way to determine them is by judging the houses he has built and by talking to his former clients. The fact that an architect may play golf or dance well in the circle where his client moves

should not be the prime qualification. Once, however, the owner has made his choice, the architect's position should be considered as confidential as that of the doctor or lawyer. The terms of employment should be frankly discussed at the beginning, no matter how close a friendship already exists between the interested parties. The amount of the fee and the services to be rendered should be agreed upon, even to such details as the terms covering abandonment of the project, or the point in the preparation of the drawings — say, when the working-plans are started — after which the cost of redrawing radical changes shall be paid for by the owner.

It will facilitate the work of the architect and ease all future dealings with him if the owner can come to a definite and candid understanding not only as to the terms of employment, but also as to the limitations of size, quality, and cost for the new building. There is a common belief that an architect will make a house cost more than the owner can afford to spend; but this is seldom the case. If the budget is carefully prepared, as described in the chapter on Costs, this difficulty can be avoided; but all the facts must be faced as frankly as a patient would explain his symptoms to his doctor, and the limit of expenditures must be recognized from the beginning.

# PROFESSIONAL FEE

After the first conference of the owner with his architect, a clear understanding should be had as to what services are expected from the architect and what his remunerations are to be.

His commission may vary on a domestic design from 6% (the architect's minimum "living wage") for a house costing \$10,000 or over, without unusual features or much ornamentation, to 10% or more for a very small house, or for one where a great deal of special work is involved. This sliding scale is necessary, as the time required by the designer and specification-writer is almost as great on a building costing \$10,000 as on one costing \$15,000. There are no more types of doors and windows to be drawn out with full-size sections, the detailed written description of the materials is no more complicated, and the client will expect as many hours of conference; for, after all, to him it is the most important house in seven counties. Many architects who have reached eminence in domestic design charge 12% or 15% on all their work, as the demand for their services justifies the increased rate. On the other hand, if the owner does not wish to pay the customary commission he will get no more than he pays for. The slogan of Something for Nothing is as unreliable in buying the services of a combined artist, engineer, and business man as in buying stocks or stockings.

If unusual engineering requirements are involved, whether in the structure or in the mechanical equipment, — such as bridging quicksand or an individual sewage-disposal system, requiring the advice of a specialist, — the additional fee is paid for by the owner; but this is not likely to occur in a house of medium size.

In the purchase of furniture or special objects of art under the direction of the architect, a fee of about 10% is customary.

On completion of the preliminary sketches, one fifth of the total estimated fee is due the architect; on completion of the working drawings and specifications, an additional two fifths; and the remaining two fifths as the work progresses.

If radical changes are made, causing the redrafting of plans already prepared, or if the project is abandoned, the services of brain and hand rendered in good faith should be paid for. The basis may be as outlined in the paragraph above, or on an hourly basis, as shown by the architect's office books.

#### **DUTIES**

The architect's definite duties, aside from being the guide, philosopher, and friend of the owner, are to consult with his client in preparing the preliminary sketches and estimates; to make full working drawings and specifications; to obtain estimates; and, after passing upon them with the owner, to draw up the contracts. At all convenient times he is at the service of his client for consultation. He must make small-scale and full-size detail drawings; and the more of these included in the estimating drawings the better. After the contract is signed, he supervises the construction, and he certifies to the amount and time when payments are due the contractor. Finally, after a last painstaking inspection, he passes upon the completion of the building in relation to the contract, which includes the written agreement, the drawings, and the specifications.

These duties are discussed in detail, subject by subject, in the following pages.

The architect is the agent of his client throughout the progress of the work. It is his duty to see that the owner's interests are protected, not only in so far as the quality of the design or materials is concerned, but also in drawing up the legal documents and checking the financial arrangements. After the contract with the builder is signed by the owner, the architect must act also as the expert who passes judgment as to whether the agreement is being properly executed, and therefore he must also pass on the relationship between the owner and the contractor as well as on that between the builder and his subcontractors.

#### NEED OF COMPLETE DATA

Occasionally a prospective home-builder will wish to employ an architect with the idea that a few sketch plans and elevations are all that are required; but it should be remembered that, in addition to this, it is essential to have careful working-drawings and detailed specifications: first, that the owner may know exactly what is contemplated, and may get accurate information on the cost before the work starts; second, that the estimators may figure closely; third, to avoid the danger of extras at a later date; and fourth, to ensure the avoidance of mistakes or misunderstandings in the coördination of the many trades which will take part in the construction.



Model

A model presents, perhaps most clearly of all, the complete conception in the architect's mind and gives the client an opportunity to suggest changes while the design is still in the plastic stage. A house designed by Arthur Bowditch, with the landscape design by Olmsted Brothers; modeled by J. W. Baston

No one would build an automobile from the beautiful colored drawing and brief description in a magazine advertisement, or expect to create a dressmaking triumph from a fashion plate, if he knew nothing of materials and fittings. Yet many a prospective house-owner will expect to build his own home, a more expensive and permanent investment than either car or cloak, from a small perspective and two sketchplans, leaving the details to any stray carpenter. Nevertheless, it is those carefully studied detail-sheets over which the architect must labor that give the final touch of line and grace, of strength and character.

The discussion of materials in the latter part of this book gives an idea of some of the technical considerations which must be solved by the architect, — or by the owner with the assistance of his professional adviser, the architect, — aside from the general plan and composition.

#### WORKING DRAWINGS AND SPECIFICATIONS

In describing the architect's duties, reference was made to preliminary sketches in contradistinction to the working drawings.

Sketches or studies. — These may be small and simple, but even so, they reveal all the elements of the plan and the essentials of the artistic treatment. They can be altered, amended, or even redrawn with comparative ease. The very fact that the studies are not precise leaves the imagination free and the mind more open to suggestions. It is like fitting a dress before the seams are sewed.

Working drawings. — These must be made on a larger scale, preferably with one-quarter of an inch equaling one foot, or, as it is called, "quarter-scale." For the preliminary sketches two floor diagrams and a freehand perspective may suffice; but for working drawings all the floor plans and the roof, all the façades, and several sections should be drawn out with the materials indicated, and with explicit dimensions noted on all the sheets. Details like the swing of doors, location of light fixtures and push buttons, headroom under stairs, and rainwater conductors should at this stage all have been carefully considered and noted. The working drawings should also include, even in the estimating stage, details of the exterior and interior on the scale of  $\frac{1}{2}$ " or  $\frac{3}{4}$ " = 1'.

Such sheets require much time and skilled labor. Changes which in themselves appear slight may involve rearrangements of supports or piping, doors or stairways, on each plan, section, and elevation, and cause a considerable added expense

to the architect. When plans are redrawn at this stage owing to the client's new ideas, he should pay for the cost of the unforeseen labor to which the architect has been put.

Specifications which accompany preliminary drawings need be only one or two typewritten pages, listing the most important materials in the walls, floors, and roof, and a line or two on the heating, plumbing, and electric wiring. Working specifications, however, should cover explicitly all the materials which are to be included in the construction and the method of installing and finishing them. For example, if brick walls are called for, the common and face brick, their bonding and jointing must be described; their protection during erection from frost, rain, and drought and their pointing and cleaning-down noted; the character of the sand, cement, lime, and coloring matter, and the method of mixing the mortar, and the tests and restrictions must be fully covered; the preparation of samples and the building in of door and window frames, outside brackets, interior framing, nailing blocks for applied woodwork, flashing, and so forth, all included, if the specifications are to be really complete.

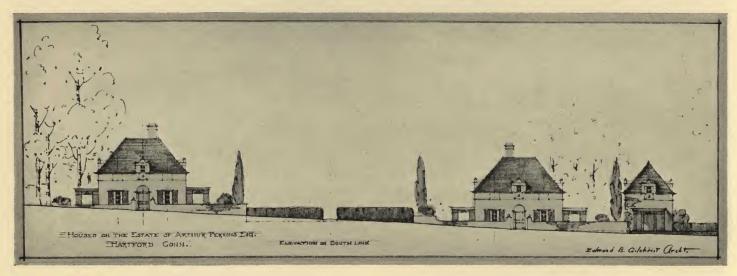
The specifications should clearly differentiate which part of the work belongs to any trade; they should be arranged in the general sequence the construction is to follow, and should be presented paragraph by paragraph, for ease of reference and to avoid misunderstandings on the job.

Detail drawings. — After the contract is let, full-size details are prepared of doors and windows, balusters, cornices, mantels, and the like. The true artistic quality of the whole design may depend on these drawings, whether it is the delicate refinement of the Colonial period or the daring richness of the Spanish Renaissance. A crude entrance doorway may ruin a well-proportioned house, or a charming fireplace may "make" a living-room.

Shop drawings. — These, based on the architect's plans, are made by the contractor and may be called for from the various trades as needed. Their purpose is to show any particular information which should be checked before actual execution is under way — such as a jointing schedule, if there is a stone portico, or assembly sheets for metal work if there are iron balconies, and similar diagrams depending on the scope of the work.

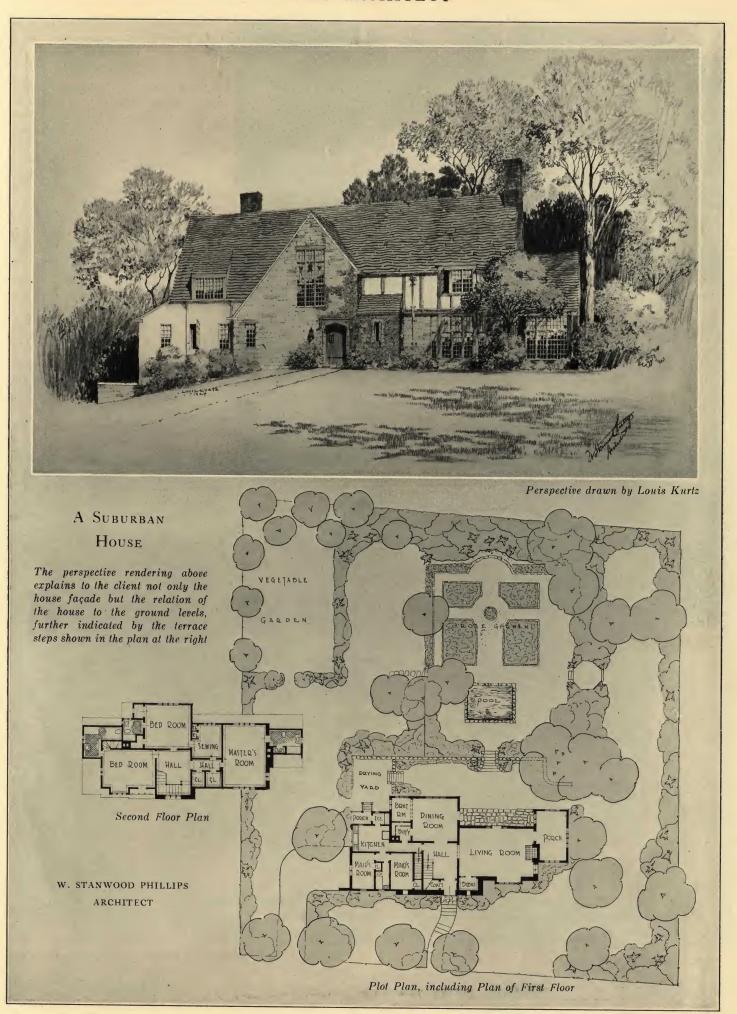
## INSPECTION

As soon as the contractor takes possession of the site, the architect's supervision begins. This need not be continuous,



Rendered Sketch

This sketch, from the office of Edmund B. Gilchrist, shows a common method of presenting the architect's conception by drawings of elevations over which has been put a light wash of gray India ink





Character in the Small House

In choosing your architect you will base your decision to a large extent upon his finished work and will seek examples that have real character, as has this house, which was designed by Eldred Mowery

as the importance of inspection varies with each part of the construction. For instance, in concrete work, each batch which is mixed and poured may be defective. Unless both the contractor and his foreman are reliable and painstaking, the architect must give almost constant supervision, because, the material once poured, it is difficult to detect faults or remedy them if found. On the other hand, in placing the floor timbers, a quarter of an hour's inspection can check a week's work by the carpenter. A mistake in spacing or sizes can be readily seen and the correction ordered.

The better the general contractor and the better his chance of making a reasonable profit out of the job, the less need there is of a close and critical supervision by the owner and architect. This is a consideration the owner must bear in mind when placing the contract, not allowing himself to be governed entirely by the prices submitted.

Inspection is by no means merely police duty. The architect and owner should treat the contractor as an ally rather than as a natural enemy. A friendly spirit of mutual give-and-take will expedite the work and stimulate the builder to

make minor concessions beyond the letter of the contract.

#### ACCOUNTING

Payments by an owner are made only on the written recommendations of the architect, who submits them monthly as the work progresses. Before construction begins, the contractor should submit to the architect a schedule showing how the total cost in the agreement is to be subdivided. A typical budget of this kind is given in the chapter on Costs. This itemized schedule serves to check the applications for payment, which are subdivided in the same manner. For example, the amount asked for on the value of the labor and material for brickwork incorporated in the building, compared to the total amount originally assigned to that trade in the schedule, can be checked approximately by comparing the brickwork already completed with that required for the entire building.

The architect must keep careful records of the contract sums, all additions and deductions, and the amounts paid the contractors, and also of the payments made to him on his commission. The details covering changes and extra payments are described in the chapter on the Contract.

STOCK PLANS

#### ic contract.

The practice we have outlined, by which each house is designed and completed by the client's own architect, working on his individual problem from start to finish, is the ideal method, by which the most distinctive results may be achieved. For a small house, however, professional advice is otherwise available.

By purchasing plans and specifications from the Small House Service Bureau, for instance,—organized by the American Institute of Architects,—a householder may procure economical, carefully considered plans, with façades of artistic merit. He must realize, however, that he is not getting personal service, nor a house designed especially for him.

The construction of houses from stock plans lacks the intangible part of architectural service in suiting the house to the owner's personal requirements, and the constant oversight and supervision for which years of training have fitted the architect. On the other hand, some architects feel they cannot afford the time for painstaking preparation of small-house plans that will bring them such comparatively small compensation. Accordingly, a frequent practice nowadays is the employment of an architect to approve and supervise the construction of a small house from a stock plan.

The Home Builders' Service Bureau of the *House Beautiful* offers a form of service which is another such transitional step between the use of stock plans and personal architectural service.

# THE CONTRACTOR

THE man who is paid to construct the building, whether an old-fashioned craftsman or a soulless corporation, is referred to as the Contractor, and it should be obvious that the more experienced, reliable, and painstaking the builder, the more satisfactory the operation and the final results will be.

In country districts, when the landholder calls on his neighbors to assist in a barn-raising, and the heavy posts and trusses assembled on the ground are hoisted into position in one afternoon, the most intimate relation occurs between owner, contractor, and workman. At the other extreme is the two-family house in the suburbs, aiming at showiness and built on speculation, where the contractor usually acts as the architect. In this case a minimum original cost outweighs any consideration of permanence, and the future owner is left to discover the faults of construction as they make themselves known, one after another. Between these two types lies the province of the average citizen.

For the home-owner the new construction is of grave and intimate importance, and, as he is not likely to be familiar with the details of construction, a relationship of mutual confidence with the builder is vital to his peace of mind.

### SELECTION

It is customary to select the contractor for building a house either directly — when his character and ability are known to the owner — or else on the basis of competitive estimates.

The first method is recommended where the owner knows he can maintain a friendly relationship of give-and-take with a certain builder, and it is usually adopted where the number of builders from whom a choice can be made is limited.

With the second method there are two procedures: (1) A limited number of desirable firms may be invited to submit estimates. Because the competition is restricted the bids will be moderate rather than remarkably low, but the owner will find that the slight additional cost will be compensated by the friendly coöperation and reliability which may be expected from a well-selected firm. (2) An unlimited competition may be held, in which an inexperienced or unreliable contractor may submit the lowest bid and, if accepted, future conflicts or inferior workmanship are bound to follow. In common fairness no one should be allowed to give the time required to figure plans and specifications if the owner does not want him to do the work.



A Well-built House

In choosing your contractor as well as your architect, you will judge of his ability by his finished work. Even a very small house will suffer if the contractor does not carry out faithfully the architect's design and specifications. The front view of the house shown on the preceding page, of which Eldred Mowery is the architect

#### SUBCONTRACTORS

In the erection of the average house many trades take part. If it is a simple wooden cottage in the country, the local carpenter and handy man is usually competent to do the entire work, with the assistance now and then of a plumber or a mason from a neighboring village. Trades unions, hours of labor, and even the exact compliance with the contract and the drawings count for but little under these circumstances.

In metropolitan districts the situation is much more complicated in that each trade is highly organized and jealous of its prerogatives, specialized labor and machinery are available, and all agreements must be carefully drawn and

scrupulously observed.

It is customary to employ one contractor for the general construction, and allow him to select the more important subcontractors for the heating, plumbing, and wiring, and his minor subcontractors for the masonry, roofing, plastering, and painting. Thus the coördination of the work is under one head and yet the responsibility for its completion is ensured both by the general and subcontractors. Owing to the added responsibility for the general contractor, it is customary for him to include as part of his profit, which is distributed through his bid, a commission on the bids of the subcontractors: but where there is competition for the main contract, he will cut his profit to a very small percentage.

If the owner employs the subcontractors directly for a few of the larger items, the responsibility for their coöperation is largely shifted to the architect, and his fee is correspondingly increased, since he is taking over part of the general contractor's work. Often a better choice of mechanics may be made in this way, and there is no danger of the builder "shopping out" the subcontracts to undesirable firms. For small residences

this method is not advisable.

A successful combination of these methods may be economically employed in projects of \$20,000 or over, by the architect taking separate bids on the heating, plumbing, and electric wiring and then allowing the general contractor to take over these figures as an allowance to be included in his

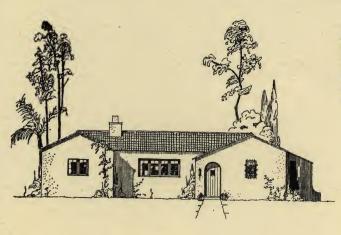
estimate, with the understanding that the firms nominated by the owner shall be employed to execute their parts of the work. This involves no extra fee to the architect, and, if the general contractor submitted his bid in competition, his commission or profit on the subcontractor's work would be reduced to a minimum, as he knows that reputable firms will be employed, and that he cannot pad his own figures if he wants to get the job.

#### **SUPERVISION**

The architect's duties require him to follow the progress of the work from the first excavation till the last workman is out of the house, and the owner should also keep in close touch. Neglect of the contract requirements or slovenly execution can be corrected before it is too late, and where modifications are optional, such as the texture of the brickwork, the color of the paint, or the exact location of a light fixture, the owner can obtain what best suits his particular desires. He should remember, however, two points. First, that he cannot demand changes from the contract drawings and specifications without readjustment of the cost; and second, that his experience in technical matters is more limited than that of his architect or contractor. A fussy and querulous owner may break down the morale of an entire building-crew and their boss, but a tactful and enthusiastic observer may stimulate the contractor to friendly concessions and the workmen to real craftsmanship.

If the progress is not satisfactory, a frank conference between owner and contractor, in the architect's office, will often assist matters. It is best to avoid discussions on the job in the presence of the workmen. Care should also be taken that instructions be given to foremen or to the contractor himself, rather than to individual workmen. Orders for any changes should go through the architect's hands and be confirmed in writing. Too many cooks spoil the broth. If Mr. and Mrs. Owner and Miss Owner all make independent suggestions, without transmitting them through their official representative, the architect, then the good old days at the Tower of

Babel will be reënacted on a smaller scale.



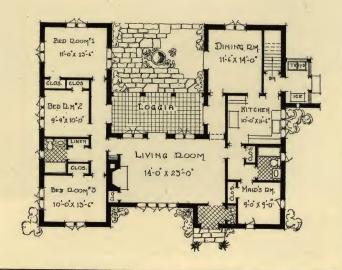
A CALIFORNIA BUNGALOW

DESIGNED BY

THE HOUSE BEAUTIFUL

HOME BUILDERS' SERVICE BUREAU

A warm climate evolves a special type of architecture, adapted both in plan and materials to special local conditions. A house like the one pictured here in the sketch is designed for stucco on hollow tile or wire lath, with a tile roof. The plan shows the rooms all on one floor, with one bedroom and the living-rooms placed around an open court which in a country like California would be used extensively





# A DUPLEX HOUSE OF WOOD

# Designed by the House Beautiful Home Builders' Service Bureau

This house has been designed to meet a demand for a duplex house that will have the appearance of a single dwelling and yet have attractive, separate entrances. Each apartment, it will be seen from this plan, has a convenient disposition of its rooms, each has a fireplace in the living-room, a corner living-room and dining-room, and a porch that is secluded from the street and that also secures considerable privacy from its neighboring porch by the placing of the service entrance. The concentration of the plumbing, by placing the two kitchens side by side and the two baths immediately over them, makes for economy. The apartment on the right has access to the third floor, where unfinished storage space could be made into bedrooms to be lighted by dormer windows

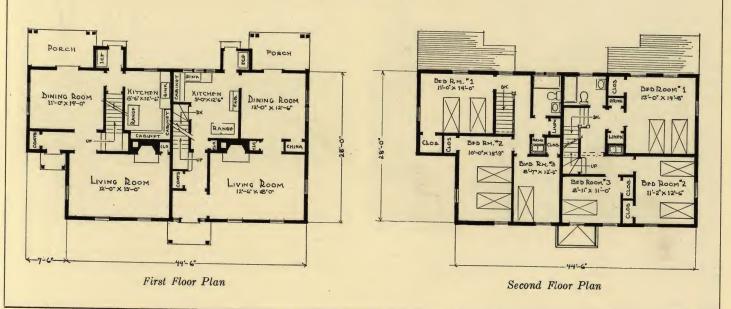




Fig. 1

The first steps in the erection of House Beautiful House No. 1.

Handling the horse scoop; a quick method of shallow excavating



Fig. 2
Ready to pour the concrete. Notice the wood forms built of boards nailed to solidly braced uprights



ig. 3

The concrete in place and framing started. The diagonal members
at the corners are temporary braces



Fig. 4

The framing of the exterior and part of the roof nearing completion. The rough boarding has been laid on all floors



Fig. 5

The rough boarding has been nailed on the outside walls and on most of the roof. No finished trim as yet inside or out



Fig. 6

The window frames have been installed and the shingling under way. The chimney has been carried up showing the flashing

# THE CONTRACT

THE contract entered into between the owner and the builder should consist of a written agreement, based on the working drawings and specifications and the general conditions which define the relationship of the owner, contractor, and architect. It should cover the various contingencies which may arise, such as strikes, fires, or the discontinuance of the work.

The American Institute of Architects has prepared a form of written Agreement for the signature of the owner and contractor. The actual printed form is not necessary, although a convenience, and the wording is by no means obligatory or universally used; but it is well established in the building trade and it precludes the danger of loosely prepared acceptances of a contractor's offer. This document can be obtained from the American Institute of Architects at Washington, D. C. In substance it is as follows:—

Article 1. — This defines the work included.

Article 2. — This states when the work is to be completed. If any bonus or forfeit clause is agreed upon, it should be inserted here; but in house-building it is difficult to prove and secure compensation for damages incurred by the owner, due to delay caused by factors under the control of the contractor. Sometimes, if there is an urgent need of early occupancy, instead of naming a sum to be forfeited by the contractor for each day or week of delay in substantial completion, a bonus is offered as a premium if the house is ready for occupancy on the day fixed. Usually, however, the sole reliance must be placed on the contractor's honesty and his own advantage in cleaning up his work promptly.

Article 3. — This covers the amount and the time of payments to be made to the contractor. Usually 90% of the value of labor and material incorporated in the building each month is to be paid by the tenth of the following month, the 10% withheld being paid, one half on substantial completion and the other half (5%) thirty-five to sixty-five days later, according to the local laws. This reserve protects the owner against failure by the contractor during progress of the work, — since a new man taking over an uncompleted operation charges more than the original amount, — and the final 5%, held up for the legal period, covers the time when any liens — that is, attachments on the house for collection of debts owed by the contractor — can be imposed. It also gives the owner and architect added time to discover any defects in the work.

Article 4. — This lists the contract data.

After Article 4 any individual clauses desired by both parties may be inserted, as, for instance, a list of the sub-contractors and their prices, if these have been selected by the owner, or noting modifications in the working drawings and specifications which may be ordered later by the owner at an agreed-upon price.

# GENERAL CONDITIONS

Because the general conditions must cover, in so far as possible, uncertain contingencies which may arise rather than predetermined details, their legal phraseology as well as their plain horse-sense built on past experience is of great importance. In order to take advantage of the accumulated experience of architects and builders, and to avoid the necessity

of referring every contract to the lawyers of each interested party, the American Institute of Architects, together with various groups of building trades, has drawn up a printed form known as the "General Conditions of the Contract." Because this is recognized throughout the country it is an immense convenience in any building operation important enough for a written agreement. Printed copies of this form may be obtained from many stationers in the large cities, or from the American Institute of Architects in Washington or its branches throughout the country, and should be bound in with the Agreement or the countersigned specifications. The following brief outline of the General Conditions can give only a general idea of the detailed, careful statement of the original form:

The contract shall consist of agreement, general conditions, drawings, and specifications to be drawn between the owner, the contractor, subcontractors under him, and the architect, and shall be signed in duplicate by owner and contractor. Outlines, instructions, and drawings for proper execution of the work are to be furnished by the architect, all copies being returnable to him after completion of the work, but one copy to be always available at the work during construction. Shop drawings and any desired samples shall be submitted by the contractor and passed upon by the architect. The architect is the owner's agent and interpreter of conditions of contract, to enforce its faithful performance, and shall decide on all matters relating to progress of work or interpretation of contract. The contractor's foreman is his representative and shall be satisfactory to the architect. Unless otherwise specified, the contractor shall be responsible for delivery, quality, protection, etc., of materials, and equipment, and his responsibility for materials and workmanship shall extend for two years from time of installation.

The contractor shall file with the owner certificates of workmen's compensation insurance, and the owner shall maintain such insurance as will protect him from his contingent liability for damages. The owner shall also carry the fire insurance, and in case of damage the contractor is paid for restoring the work destroyed. The owner is entitled to require a guaranty bond from the contractor, thus assuring completion of the contract despite death of contractor, or other contingency, although in private work and with a trustworthy and financially sound contractor a bond for the completion of the work is not essential, and the saving of the premium is often a justifiable economy. Permits and regulations shall be the responsibility of the contractor, and royalties and patents shall be paid by him.

The use of the premises shall be regulated for the contractor by laws, ordinances, and the directions of the architect. Cleaning up of the premises during the work and at its completion shall be done by him. The work shall be always accessible to owner and architect, and inspections shall be

promptly made.

Application for payment, if made on valuation of work done, shall be submitted by the contractor ten days before each payment falls due, whereupon the architect shall issue a certificate for such amount as he decides to be properly due, to be paid by the owner. If the architect does not approve the entire application for payment, he recommends withholding payment until conditions are remedied; and if the

owner fails to pay the sum named upon demand when due, the contractor is entitled to interest thereon. With certain exceptions, the making and acceptance of the final payment is a waiver of all claims for both parties. It is not due until the contractor delivers to the owner a complete release of all liens and removes all his belongings from the premises. Any changes made by the owner on written order, countersigned by the architect, shall be adjusted accordingly in the contract sum, and any claims for extras shall be made by the contractor in writing within two weeks of receipt of such orders. A fair allowance may be deducted by the owner for any work found not in accordance with contract conditions. Cash allowances may be included in the contract sum for the purchase of definite items to be selected by the owner or the architect — such as hardware, and so forth.

The time limit of the contract may be extended for justifiable delay if claimed within seven days of occurrence. On neglect of the contractor and by approval of the architect, after three days' notice to the contractor the owner may prosecute the work and charge it to the contractor. If the contractor is legally incompetent, the contract may be terminated by the owner, or if work is delayed for three months or the owner fails to pay just claims, the contractor may stop work. Claims shall be made in writing and adjusted by agreement or arbitration; disputed questions to be arbitrated shall be filed with the architect, and the arbitration conducted according to State laws, the work to be prosecuted meanwhile.

The owner may have more than one contractor on the job answering to him, and should damage be caused one contractor by another, the contractors are mutually responsible. Subcontracts may be let by the contractor and shall be submitted by him for the approval of the architect; the subcontractors shall be directly responsible to the contractor rather than to the owner, and shall be bound by the general conditions, drawings, and specifications.

#### THE "COST PLUS" PLAN

The safest form of contract, and the one described in the preceding pages, is on the basis of a fixed price. This, of

course, can be arrived at only where there are full plans and specifications for estimating and where normal conditions can be foreseen.

Where construction must be started before working drawings are completed and so no true estimate is possible, or in alterations where the structural problems cannot be predetermined, or where the owner has facilities for doing much of the work himself, or where the local conditions of transportation or labor are abnormal, the form of contract on the basis of cost, plus a percentage or cost, plus a fixed fee is sometimes adopted. The need of such agreements was exemplified in the case of the World War, but the disadvantages of such methods were shown in the cases of fraud in building camps and airplanes.

A "cost plus" contract is one in which accurate accounts are kept of labor, the payrolls being checked regularly by the owner or his representative and then submitted with all bills, and in which a percentage, usually 10%, is added on all expenditures as the contractor's own wages and profit. With a small country carpenter who devotes all his time to the work a salary may take the place of the 10%. With a large organization another percentage, sometimes as high as 12%, is added besides the profit, to cover overhead expenses of office, rent, clerical force, and the like, which could not be readily itemized or apportioned.

If it would seem that a percentage profit was too much of an inducement to run up the cost, a fixed fee can be agreed upon beforehand, to cover the overhead and the legitimate clear gain due the contractor. This also serves as an incentive to the contractor to speed the work, for the sooner he finishes his work the less will be his own expenses of operating the job, and the sooner he will receive his net profit and be free to devote his own time to other projects.

With the best-intentioned builders it is not always possible to prevent the cost from exceeding the preliminary estimate, a frequent cause of misunderstanding between the owner and the contractor. For this reason neither form of "cost plus" agreement should be adopted where it is convenient to use the fixed price.



A Spreading Plan

In warm climates where the expense is not greatly increased by spreading the house over the ground, there is much charm in such a house as this with low wings partially enclosing an open patio. Soule, Murphy & Hastings, Architects

# FINANCING

AMONG the diversified problems of the prospective home-builder, one of the first and also one which is linked up with the determination of the budget, is the financing or consideration of the new home as an investment. In the preceding chapters the budget has been referred to as something to be spent: here it will be studied as something to be accumulated. It is obvious that every prospective home-builder should thoroughly analyze his problem from the

business point of view, for it may be the most important financial transaction he will ever make for himself.

The first consideration is to fix the limit to the amount of money which is available for this investment. Before the land is selected or the first sketch plans prepared the would-be house-builder must determine:—

How much can he afford to pay? How much has he on hand and how much can he borrow?

What is his annual income and what is the likelihood of its stability, growth, or decrease?

What is being paid annually for rent?

How much of the income can be saved?

If the above questions are answered without optimism or bias, it is easy to determine what can safely be counted upon as the amount available each year to be assigned to the payment of interest on the building-loan, and deposits on the sinking fund to repay borrowed capital. Such payments to reduce the principal little by little are referred to as "amortization."

The definition of the satisfactory home is one that will not absorb too

much of the family's income in interest and running expenses, nor yet, on the other hand, be below the family's living standards.

It is a mistake to purchase a lot and contract for building a house beyond one's normal ability to pay, as it may result in the loss of the home through the foreclosure of a mortgage, or else in a long and discouraging struggle. On the other hand, the determination to invest in the very best quality of house which can be obtained is an incentive to economy and saving; in the end, property has been acquired which is of real intrinsic value and, at the same time, a guaranty of happy family life.

# PER CENT OF INCOME TO DEVOTE TO PAYMENTS

The interest on a building-loan and the cost of upkeep, combined with the payments against the principal of the loan, may be considered not only as the equivalent of the rent which the family can afford to pay, but also as the savings which they are able to set by, in addition. This is because the payments on the principal are like the deposits in a savings bank; when the loan is paid off, the property has a clear title. In

addition to the interest and installments, allowance must be made for repairs and unkeep on the house, taxes, insurance, and other items. Families accustomed to living in apartments may fail to allow for the cost of fuel for heating, and for the cost of water and electricity, if either of these is included in their rent. In building a home it is well to remember that the sacrifice of temporary luxuries, such as expensive amusements, is soon forgotten; but a well-built house will last for generations

# COST OF LAND

Operating on a sound economic basis, the cost of land purchased as a home site should not exceed twenty per cent of the cost of the building which is to be placed upon it. Where a greater area of land is required, it should be considered as an added expenditure for the pleasure of the owner. Where land cost is so high that the average-sized building-lot bears much greater than a 20% relation to the cost of the house, it is unwise to purchase, unless the desire for location in that particular neighborhood is worth the added cost. The banker will not recognize more than a 20% land-value when he makes a mortgage loan on residence property.

Not many persons are in a position to expend the entire cost of land and building without recourse to mortgage loans. In days long past it was considered somewhat of a disgrace to have a mortgage on the home. To-day it is a sign of good business judgment. The mortgage makes home-owning possible for many who otherwise could not build. For those who can afford to own an unmortgaged home, a mortgage pro-

vides funds for other investments.



Sleeping-Porch

A large opening filled with folding French doors provides plenty of light from this sleeping-porch which is placed on the only outside wall of the bedroom. Architect, Eleanor Raymond of Frost & Raymond

# EXPENSES EQUIVALENT TO RENT

Generally speaking, it is cheaper to own a home than to pay rent; but the popular slogan of the real estate broker and speculative builder, "Why pay rent? Own your own home!" should be liberally discounted, for the equivalent of rent must be met. Again, by analyzing carefully the cost of owning a home, the temptation to take on too great a financial responsibility may be overcome by cold figures — to the ultimate benefit of the owner.

It is true that when one owns a home there is no rent — in its ordinary sense — to pay, but the equivalent of a rental is paid, nevertheless, and the essential question is, How much? Here are the important items of recurring cost which take the place of rent, when a home is built by means of a loan or mortgage: —

Interest on first mortgage
Interest on second mortgage (if any)
Taxes: city, county, town, or school

Water rent or tax
Maintenance: painting, repairs, and so forth
Depreciation
Interest on investment
Insurance

Interest on First Mortgage. — This must be reckoned for one year at prevailing rate, according to local conditions.

Interest on Second Mortgage. — This must be reckoned similarly, if such is required.

Taxes. — The local tax office appraises the property, usually for about one half to three quarters of its value, although this factor varies in different localities. By inquiry as to nearby assessed valuations or appraisals for taxation, a fairly close estimate may be made as to what the authorities will say the property is worth for taxation purposes. This amount is called the assessed valuation, and is usually — though not always — less than its real value. Local tax rates are established periodically, and taxes are figured by applying the rate to the assessed valuation. Thus an \$8000 house and lot may have an assessed valuation of \$5000. The tax rate may be \$17.80 (which means \$17.80 for each \$1000 of the assessed valuation). In this case the annual tax bill would be \$89.00.

Water Rent or Tax. — This is a small annual charge to cover the expenses of water supply. It is based on the number of water outlets or reckoned by meter, and the average cost may be easily determined by inquiry.



Character in the Small House

From the moment the house is first conceived there should be in the owner's mind a distinct picture of the character to be realized inside as well as outside. This house bears the stamp of a definite goal attained. Eldred Mowery, Architect Maintenance. — The cost of upkeep, including painting and all repairs, is included in this item, which is found to average annually from 1% to 3% of the cost of the house. It is higher in frame construction than in masonry.

Depreciation. — This charge is estimated on the average life of the house and is usually figured at about  $2\frac{1}{2}\%$  per year where a good class of permanent construction-materials is used. It is, of course, less for the first few years and more in an old house.

Interest on Investment. — An item often overlooked is interest on investment, which is limited to the amount of cash actually invested in the house (equity). While this is not a direct payment, it should be figured at the present rate on what an equal amount of money would be earning: usually 5% in Eastern states and 6% in the Middle West and South.

Insurance Cost. — The annual fire insurance premiums, which any insurance broker will approximate, must be included.

After these costs have been fairly determined and tabulated, one knows about what it will cost annually to occupy the house — the equivalent of rent.

### HOUSING SCHEMES TO REDUCE COSTS

A house to accommodate more than one family may be built as an aid to the owner's financing of his own domicile, the subsequent rent from his tenant serving to cover the running-expenses of the building while his own payments — equivalent to rent — may be applied on the mortgage. This has worked out successfully in many cases, but it depends upon so many local housing-conditions that little general advice in regard to it can be formulated. It is often possible for a prospective house-owner to extend his own home to include another tenement at a cost of a third more than his own requirements, the rent from the additional unit serving thereafter as interest on his investment. This may be done in an attractive and livable design, although many two-family houses built for speculation and otherwise do not fulfill their possibilities.

A house for two families may be divided vertically, and called technically a "duplex" house, or horizontally, in which case it is called a "two-family" house. In either case the apartments may be similar, or, if the owner builds it to live in himself, his needs may be satisfied first and the other tenement designed accordingly. The unsymmetrical house, that is, with one apartment larger than another, is likely to have the more attractive exterior. The advantages of the duplex house are an equable allotment of land and more independence of the tenants, whereas the two-family house, divided horizontally, has the advantage of equally favorable exposures for each family.

Group housing, carried out in a number of ways, is now being developed successfully in this country, as has been done in Europe for a number of years. In its broadest sense it is community planning, carried out from the beginning so that the individual may avail himself eventually of the fullest opportunity the situation affords, without additional expense to himself and with the greatest convenience during and after building. Or, again, it may be a coöperative housing-scheme for a group of homes owned by a coöperative association in which each tenant owns stock. This is undertaken by a group of people with some common interest and approximately equal resources, who form an association, select property upon which to build, and negotiate the financing and construction of the houses, selling the members certificates of stock and giving ninety-nine-year leases to those members who are tenants. Henceforth the tenant pays regularly his share of the



Character in the Small Apartment

The elements here are few but they have been blended with great skill to make a homogeneous setting that is rich in color and restful in line. Allan B. Craven, Decorator

operating expenses, which decrease yearly. Subletting at no profit is permitted the lessor, by approval of the board of directors, or his shares may be bought back by the association and sold to a new member.

Coöperative schemes offer good opportunities to those who appreciate their privileges. The form in which they are carried out may differ in particular cases in the business agreement as well as in design of the houses. The advantages of common areas for playgrounds, gardens, drying-yards, or garages are among the economies of planning for more than one house at a time.

# MORTGAGE LOANS

For the individual home-owner, it is highly important to know the logical channels of obtaining mortgage loans; what to pay for such service; how best to present a mortgage application, to ensure favorable and liberal consideration on the part of the individual or institution making the loan.

First, one must be in full possession of the land on which it is proposed to build the house, and this land must be free and clear of any mortgage; or there must be an agreement by which the mortgage on the land can be paid off immediately, so that the building and permanent mortgage-loan may take its place as a first mortgage.

One must be in a position to prove clear title to the land in question. In regions where title insurance is customary, it will be necessary to have a title-insurance bond for the protection of the mortgagee. In other sections a record of search, usually in the form of an abstract, will be required as proof of

clear title. A survey of the property, certified by an official civil engineer, will also be required.

The other important factor to be considered in applying for a mortgage loan is that one should be able to present a good set of plans and specifications. In addition, it should be remembered that well-prepared plans, particularly if carried out under the direction of an architect of good reputation, have an important bearing on the appraised valuation of the house. If the plans and specifications indicate a well-constructed and efficiently planned building, with little waste room, and calling for the best materials, and which will maintain sound real-estate valuation, the attitude of the prospective mortgagee will be much more favorable in regard to the proposed loan.

The sources from which it is possible to obtain mortgage loans for residential building purposes are as follows:—

Savings Banks. — The savings bank is an excellent institution from which to obtain a loan, as the original cost of arranging it is very low, usually not exceeding one half of 1%, and the mortgage can usually run undisturbed for many years. In many states the savings bank is not allowed by law to loan more than 60% of its valuation of the property.

Title Insurance or Trust Companies. — In districts where such organizations operate, these are usually good sources from which to obtain loans for home-building. Experience shows that title companies will usually appraise property at slightly higher valuations than will savings banks, and consequently they will at times make more liberal loans. The usual policy



Cottage Character

Here a very simple effect has been obtained but it is the result of conscious effort in a definite and well thought-out direction rather than of a haphazard assembling. Louis S. Weeks, Architect



A Dining-Porch

The classic character of this house has been extended to the dining-porch, where a distinct feeling of graceful formality is expressed both in the background and in the furnishings. David Adler, Architect

of the title company is to make a loan at 5% to  $5\frac{1}{2}\%$ , and the aggregate loaning activity is financed by selling these mortgages on a guaranteed income of  $4\frac{1}{2}\%$  to 5% to the average investor, thus re-financing the company's activities.

Insurance Companies. — Fire and life insurance companies, particularly, usually have large reserve funds which are available for mortgage loans under banking supervision. The operation in the case of such a company is similar to that of obtaining a loan from a savings bank, title, or trust company. In various towns and cities a local representative of a large insurance company usually takes mortgage applications, or some bank or trust company may be designed for this purpose.

Private Funds. — Building and permanent mortgages are often obtained directly from private sources through personal or business acquaintances who may have money for conservative investment. In such cases the services of an attorney are usually depended upon for completing arrangements.

Mortgage Brokers. — In metropolitan districts the services of mortgage brokers are very often called upon for placing loans on dwellings. Many real estate men also act as mortgage brokers. Immediately upon receiving application from the owner, the broker will go into the market to place the mortgage, and for his services is paid a commission, usually varying from 1% to 2%. In placing the average mortgage there is a percentage charged to cover cost of the operation, which

may include cost of filing and recording, attorney's fee, broker's commission, and other costs which may be incurred.

In placing a conservative mortgage on a dwelling, there are so many sources which are directly available to the homeowner that it is not a wise proceeding to enlist the services of a mortgage broker unless the owner is willing to pay the necessary fees to have this work done for him. It is bad policy to interest more than one broker in obtaining a mortgage loan at one time. A better method is to give a broker what is known as an exclusive authorization to obtain the loan; otherwise, if more than one broker is visiting various firms or individuals, the owner's application becomes somewhat discredited.

Building and Loan Associations. — The operation of these organizations is fairly familiar to most home-builders. Building and Loan Associations will be found in almost every city and town. The general procedure is to become a member of the association by opening a savings account with them. The application is made for mortgage loan when required. This loan is made on a basis of 60% to 70% of the value of the land and building; it is usually repayable on a monthly basis, consisting of 1% per month of the face amount of the mortgage. Thus, on a \$6000 building-and-loan mortgage the monthly payment would be \$60.00, part of which is applied to the principal; the balance is interest which is adjusted monthly, usually 6%. On this basis it takes eleven years and seven months to pay off the mortgage completely.



**Dutch Colonial** 

The photograph of this small corner is sufficient to betray the fact that this house has the stamp of the Pennsylvania type of architecture, of which the paneled woodwork, deep window reveal and H-L hinges are characteristic

#### SECOND MORTGAGES

Borrowing second-mortgage money is sometimes necessary. It is evident, however, that the second-mortgage money will be more expensive than that obtained on first-mortgage loan. The second mortgage usually bears the brunt of any misfortune which may happen to the property. In case taxes or interest are not paid and it becomes necessary for the first mortgage to foreclose, the second mortgage must be in a position to pay off the first mortgage and protect his own interest; otherwise, under foreclosure proceedings, his investment is in danger of being wiped out. In view of the greater risk, a second mortgage usually carries 6% interest and requires the payment of a substantial bonus to induce the lending concern to take the risk.

The second mortgage may be obtained from the following sources:

Builders. — In many cases the builder is willing to take a second mortgage as payment for his services. In this manner he receives liberal payment, and his usual method is to discount the second mortgage by selling it at a substantial reduction in price.

Attorneys. — Attorneys often have clients' funds available for second-mortgage money.

Institutions. — There are regular second-mortgage institutions that will make the necessary loan on the payment of a bonus, which may vary from 5% to 15% of the principal involved, depending on the location of the property, the availability of second-mortgage money in that district, and

on the amount required. If the first-mortgage loan is low, second-mortgage money is usually less expensive.

It must be realized that, when a home is built under first and second mortgages, the owner is dangerously close to the shoestring type of financing. Usually a second-mortgage loan has an expiration period equal to the first mortgage; but at this point it differs from the first mortgage in that payment is usually demanded - or at least a substantial reduction of the principal — at the time the second mortgage falls due. Savings banks, title companies, and other sound financial institutions do not deal in second mortgages, and consequently this business is often left to a less dependable class of business men. While many sources of second-mortgage money are dependable and honorable in their business dealings, there exists, unfortunately, a class of second-mortgage dealers known as "sharks." Their policy is to make a secondmortgage loan, charging as great a bonus as it will bear, and to foreclose immediately upon the termination of the loan period unless the owner pays off the entire principal. Through this method many home-owners who have overestimated

their financial powers may be forced out by foreclosure. Certain "Loan Trusts" are the reverse of philanthropic in their purpose, and, although they may advertise loans at extremely low rates, they make an undue profit by giving no interest to depositors, by demanding the same monthly interest no matter how much has been paid off against the principal, or by enforcing unfair penalties in case of failure or even slight delay in the payment of interest.

#### INSTALLMENT PAYMENTS

No matter what the size of the loan, it is always the best policy to arrange for partial payments at regular intervals. Thus, on a loan of \$5000 at 5% interest, payments of \$50.00 a month, or \$600.00 a year will take care of the interest on the loan and cancel the principal in less than twelve years, leaving the home free of debt. If gradual amortization is not made, the total amount of the loan must be met when due, and without the stimulus of being obliged to meet small regular payments, it is doubtful if sufficient savings will accumulate to cover the total sum. For this reason such loans may drag along for a lifetime.

In the little booklet on "How to Own Your Own Home," issued by the United States Department of Commerce, there are some interesting tables of statistics giving various incomes, values of the home, and annual outlays. From these one case has been selected as typical, where the value of the house and lot is put at \$10,000 and the first cash payment (or the amount of available funds) is placed at 30%.

music rands) is placed at 30%.	
Value of house and lot	\$10,000
Annual income	5,000
First cash payment (30%)	3,000
Amount of loan	7,000
Interest and amortization (12% of loan)	840
Estimated taxes, insurance, and upkeep	400
Total annual expenses	1,240
Savings included in above total (first year)	420
Expenses comparable with rent (first year)	820

This, of course, is but the simplest outline, as a suggestion for the home-builder in preparing his budget. Local tax rates on real estate usually amount to 1½ to 2½% of the market value; fire insurance rarely amounts to ½% of the value of the house; the yearly upkeep may be roughly estimated at 1% of the value of the house, depending on the quality of construction and the attention given by the owner. The "savings" represent the amount that is paid out on the principal of the loan, and the annual savings grow larger as the principal of the debt grows less.

# COSTS

THE first requirement in housebuilding is some candid thinking by the prospective home-builder. The owner, or in this case the owner-to-be, must determine what he wants and what he can afford. As a start, he should jot down in black-and-white the minimum requirements — that is, a list of the really necessary rooms; he should then put down in cold figures just what funds are available. If he is familiar with the cost of houses similar to the one he wants, he can "strike a balance"; if not, he should consult an expert to decide, on the basis of the actual building market, which features are necessities to be retained, and which are luxuries to be sacrificed.

In any project there are three variables to be considered, the *size* of the building, the *quality* of the materials, and the final *cost*. If any two are predetermined, the third is of necessity fixed. For example, if a big house is wanted and a low price is set, then the material and workmanship must be cheap. If the number of rooms is reduced, the materials may be better. If, however, the size of the house and also the quality of materials and workmanship are settled in the mind of the owner, he must remember that the cost will be determined by the building market, and not by his inner consciousness.

It is important to determine at the outset a schedule of the essential elements, and also of those which are nonessential but desirable. Their approximate sizes should also be decided upon. What is the minimum number of bedrooms? Of bathrooms? Are the halls to be skimped to enlarge the rooms? Is the roof to be a thing of beauty and a joy forever, or just a short-lived covering to keep out wind and weather? Are there to be fireplaces or only radiators? Such questions must be asked and answered by the owner or the architect. From the schedule the size of the building can be approximated after the number of stories is agreed upon and a very rough estimate can be given by the architect or contractor by "rule of thumb," on the basis of cost either per square foot of area or per cubic foot of volume. This, however, to be even fairly accurate requires knowledge of the price of similar buildings recently constructed in the same locality, as the market varies from year to year and from one part of the country to another, and is affected by local conditions, both of site and of transportation.

The next step is to have prepared small-scale sketch plans and a typical elevation, with a page or so outlining the materials. These can be submitted to one or more reliable contractors for close approximate estimates covering the general construction, heating, plumbing, lighting, and wiring. With this budget it is possible to determine what additions or deductions in the size and quality must be made to suit the owner's purse. At the same time these early studies can be carefully checked with houses familiar to the owner for the size of rooms, the orientation, — that is, the relation to the points of the compass, — and the conditions at the site.

The preliminary estimates are usually for the general construction and the heating, plumbing, and electric wiring, but they seldom include the grading, which later will be added, nor the accessories—like light fixtures and window shades—which, though essential, are not under the general contract. The architect's fee also should be kept in mind. In

fact, the sooner all possible contingencies can be taken into consideration the smoother the future progress will be.

The general contract usually includes the following:

General construction

Heating

Plumbing Electric wiring

Gas piping

Rough grading immediately around the house

Connections for water, gas, and electric mains Connections to sewer or a cesspool

Building fees

Liability insurance

Bond

Minor details permanently built in — such as sinks, plumbing-fixtures, and hardware.

The general contract commonly does not include the following:—

Architect's commission

Fire insurance

Finished grading

Walks, drives, and planting

Movable items, such as kitchen range, light fixtures, window shades, fly screens, door knocker, mirrors, and carpets.

The price of labor and the price of materials vary greatly not only from year to year, but from season to season, and not only in different parts of the country, but even in different parts of the state. Climate, trades-unions, transpor-

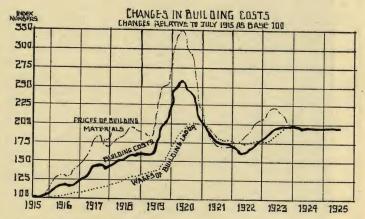


Chart of Building Costs

This chart shows the changes in building costs since 1914 when they are represented by 100. The building costs of 1925 are charted through June and show that a fairly even level has been maintained since the middle of 1923

tation, competition, the size of the building, and the local conditions at the site all contribute, in one way or another, in determining the actual cost. For this reason no general unit basis is reliable. The cost per room, per square foot of area or per cubic foot of volume, obviously must fluctuate greatly with the type of construction and the character of finish.

In order to stabilize the building industry to the benefit of both builder and owner, the Department of Commerce and



The Eastern Prize House

This house belonging to B. P. Adams, Esq., and designed by James C. Mackenzie, Jr., Architect, won the prize recently offered by the House Beautiful for the best small house built east of the Mississippi during the last three years at a cost not exceeding \$25,000. It is built in a clearing on the brow of a hill overlooking the Hudson River where once stood an old Revolutionary blockhouse, part of whose foundations have been incorporated in the house. Local stone found on the site and carefully selected for varied color has been used for the walls, giving them an appearance of old masonry, and copper shingles in various tones of brown and russet have been used on the roof. The plans and elevations of this house may be found in the blueprint section on pages 26 and 27

other agencies urge upon us the advantages of winter construction. Modern construction methods and equipment can be used successfully in adverse weather-conditions, giving work to the contractor during what is usually a slack period and saving several months for the owner in the completion of his house. The advantages also extend to the architect's office and the sources of construction supplies. The costs are of course higher in some respects, but are balanced by the fact that the most efficient workmen are likely to be available, the handling of supplies may be done more economically, and in general there is the difference between a rush job and one undertaken without other conflicting interests. As the methods for handling winter work develop further, and as manufacturers, dealers in supplies, and the building trades do more to encourage winter work, the cost to the owner can be appreciably reduced.

Reproduced in this chapter are plans and elevations of three houses which have been constructed recently in different parts of the country, costing from \$14,000 to \$15,500. Photographs of two, with a perspective sketch of the third,

are shown on pages 20, 21, 22, and 23.

Two of these houses are prize-winners in the competition held by the *House Beautiful* magazine for the best small house built within the past three years at a cost of not over \$25,000, with one prize for the East and one for the West. The awards were made upon consideration of three factors; excellence of design, adaptability to lot and surroundings, and convenience and economy of plan. The third, a duplex house, has been designed by the Home Builders' Service Bureau of the



Main Entrance, Eastern Prize House
Over the door is a wooden lintel made from a driftwood log
taken from the river, and around the opening old bricks have
been worked in to give variety of texture and color

House Beautiful magazine, as a suggestion for a house which will carry or help to carry its own running expenses by the revenue from the extra apartment. The estimated cost of this house is a little less than \$14,000. A house from a similar Service Bureau design has been built in New England in 1925, and the specifications given here are based on those used for that house.

A word should be said here about the specifications given below. They are in no sense complete nor are they given as ideal, that is, as showing the best materials to be used under average circumstances, or even under the conditions applying to these particular houses. They are simply outline specifications of the houses as they were actually built and show the materials that were chosen by the owners or architects.

Following are outline specifications for the three houses illustrated in this chapter.

# BRIEF SPECIFICATIONS FOR THE EASTERN PRIZE HOUSE

Excavation.— Remove and stack topsoil for depth of 12". Excavate for cellar and 1st floor as indicated by drawings and for foundation walls at least 4'-o" below finish grade.

Foundations. — Stone rubble.

Exterior Walls. — Stone rubble laid and pointed on exterior as directed. All in cement mortar with integral water-proofing.

Chimneys. — Build in T. C. linings of sizes shown.

Roof. — Anaconda copper shingles of varying colors. Copper hung gutters.

Plastering. — All walls and ceilings, except in ceiling of studio and library, to be best 3 coat work in sand finish. Between exposed rafters neatly fit sheet-rock with insulation of Celotex.

Framing. — Beams and studs, spruce. Rafters, yellow pine. Finish Flooring. — Georgia pine.

Hardware. — Supplied by owner; installed by contractor.

Painting. — Exterior woodwork: 3 coats lead and oil, colors selected. Interior woodwork: 1 coat stain, 1 coat white shellac and 1 coat wax. Bathrooms and kitchen, 3 coats of lead and oil, 1 coat Edward Smith & Co. enamel.

Glazing. — Best quality clear double-thick American.

Plumbing. — Supply lines, galvanized iron. Fixtures, enameled iron bathtubs and lavatories, vitreous china water-closets. Brass Crafters' medicine cabinet.

Heating. - One-pipe, steam Arco boiler.

Electric Wiring. — B X cable.

# BRIEF SPECIFICATIONS FOR THE WESTERN PRIZE HOUSE

Grading and Excavating. — All piers and walls to rest on solid ground, with chimney footings at least 4 feet below natural grade. Over unexcavated portion two feet of clear space between first-floor joists and the ground.

Concrete. — Foundation walls, footings, piers, and areas, of rough concrete, I-6-6, or brick. Concrete in proportion of I-2-4 for reënforcing beams, walls, or slabs. Rough concrete 3½" thick over areas, excavated portion, and for tile floors in two bathrooms (with wire-mesh reënforcément). Surface coats troweled to smooth, even surface. Dining-room terrace, 4" concrete blocks in three sizes, cast on job, laid with 2" joints.

Exterior Walls. — All exterior walls to have cement plaster finish, three coats; final coat sand-finish, troweled smooth. All exterior wood, clear-surfaced redwood.



The Western Prize House

This house, belonging to George S. Hunt, Esq., and designed by Marston, Van Pelt & Maybury, Architects, won the prize offered by the House Beautiful for the best small house built west of the Mississippi during the last three years at a cost not exceeding \$25,000. Plans and elevations of it will be found in the blueprint section on pages 28 and 29



A Duplex House

This house, designed by the House Beautiful Home Builders' Service Bureau, is planned for two apartments, a larger one of six rooms for the owner, and a smaller one of four rooms to be rented. Plans and elevations of it will be found in the blue-print section on pages 30 and 31. They may be purchased from the House Beautiful Home Builders' Service Bureau



#### Main Entrance

The deep reveal of the entrance doorway produces a deep shadow which in turn gives the necessary accent to this important feature of the house; a simple plaster moulding and the deep, rich coloring of the paneled door make the only attempt at decoration

Chimney. — Built up of common brick, flues running direct to top of chimney, capped with fire-clay thimbles.

Roof. — Dipped cedar shingles, 24", laid at random 4-10" to the weather. Flashing, galvanized iron. Counter-flashing, lead. Gutters, galvanized iron.

Framing. — Oregon pine. Sills and entrance-door frame of 2" white oak.

Windows. — Wood frames of sugar pine with glass 16 oz. A. A. #1.

Interior finish. — First quality, straight-grain Oregon pine, beams with adzed finish.

Finished flooring. — In principal rooms, plain-cut white oak; elsewhere, straight-grain Oregon pine.

Plastering. — On wooden lath. Two-coat work, with uneven plastered texture.

Plumbing. — Cold water system, galvanized wrought-iron pipe. Gas heater for hot water. Fixtures include: 3 porcelain enameled-iron bathtubs and lavatories, vitreous china toilets, shower with needle attachment, enameled sink, 2 laundry trays and lavatory of enameled iron, pantry sink of copper.

Electric wiring. — In iron conduits, except bell system. Tumbler switches. One complete circuit of lights controlled by switch in master's bedroom. Complete bell system with communicator.

**Heating.** — Four gas-burning units for warm-air heat, each with manual control located in hall.

# BRIEF SPECIFICATIONS FOR THE DUPLEX HOUSE

Excavation.—Remove sod and loam from portion of lot to be excavated and stack where directed. Excavate for cellar as indicated on drawings. All foundations must go below frost and to proper hardpan to carry the load.

Concrete. — Foundation walls, footings, bulkhead walls, etc., of concrete, made up of I part cement, 2½ parts sand and and 5 parts stone. Build chimney cap, cellar floor, outside steps, of concrete made up of I part cement, 2 parts sand and 4 parts stone. Cellar floor to be 3" thick and board-floated. Make facing of chimney cap and area walls above grade of concrete, made up of I part cement to 2 parts sand, troweled to a smooth finish.

Exterior walls. — First story on front to have cement plaster finish on wire lath, three-coat work, final coat to have sponge finish. All other walls to be white Creo-Dipt 24" shingles, exposed 9" to the weather.

Chimneys. — To have T. C. flue-linings of sizes shown, set in cement mortar.

Roof. — Shingles to be of white cedar of best quality, laid  $4\frac{1}{2}$ " to the weather.

Plastering. — Wood lath throughout, except the ceiling of heater room and the soffits of all stairs, which have metal lath; two-coat work with last coat smooth skim, except ceiling of cellar and soffit of cellar stairs, which have two heavy coats left rough.

Framing. — Spruce. Girders of hard pine.

Finish. — Inside finish, North Carolina pine.

Finish flooring. — Except in kitchen, rear entry, kitchenette, and bathrooms, floors to be of oak. Kitchen, rear entry, kitchenette, and bathrooms to have linoleum laid in cement over double floor, the upper one of which shall be kiln-dried N. C. slash pine.

**Hardware.** — Supplied by owner and installed by contractor.

Painting. — Exterior woodwork to have three coats pure white lead and pure linseed oil, in colors selected by owner. All exposed metal to be painted red lead, followed by two coats lead-and-oil paint. Interior woodwork in master's portion of first floor, second-floor hall, and bathrooms to have three coats lead and oil; bathrooms to have one coat enamel in addition. Paint closet shelves two coats lead and oil. Remainder to be stained with one coat oil-stain of color approved by owner, and two coats of shellac. Rails of stairs, also counter and shelves of linen closets, to have one coat of oil stain and two coats of shellac. Counters and shelves in kitchen specified as hardwood to have one coat of oil. Walls of kitchen, entry, kitchenette, and bathrooms to be gluesized and painted with three coats of lead and oil; two coats for walls of all closets and cupboards.

Glazing. — To be best quality obtainable in stock sash.

Plumbing. — Cold-water supply pipes, galvanized iron; hot-water supply pipes, brass. Fixtures include: 2 trays in laundry of enameled iron, I enameled iron kitchen sink 20" x 30", and I enameled iron kitchen sink 22" x 36", 3 enameled iron lavatories 18" x 24", 2 enameled iron 5' tubs, 3 water-closets of vitreous china.

Heating. — Steam, or hot water.

Electric wiring. — All wires B X cable.

Gas-piping. — Gas pipe to both kitchen ranges as shown on plans, and two outlets in cellar for gas water-heaters.

# HOW TO READ BLUEPRINTS

BRICK IN SECTION

BRICK IN ELEVATION

STONE IN SECTION

STUCCO IN ELEVATION

MARBLE IN ELEVATION

METAL IN SECTION

WOOD IN SECTION

METAL IN ELEVATION

CONCRETE IN SECTION

TERRA COTTA IN JECTION

TO some people blueprints are puzzles so intricate or in such strange language that, rather than attempt to find any order within the chaos that the many lines and symbols present to them, they leave the matter to their architects. These are the people who say later, when the house is completed, "Oh, I did n't know it was going to look like that," or "I did n't know the living-room was going to be so small,

or that there was n't going to be room in the principal bedroom for double beds."

If they had made an effort to visualize the house in its complete form according to the design and plans that the architect indicated in his drawings, they would have been spared many, if not all, of their disappointments.

To read plans properly the home-builder must train himself to add the third dimension which the drawings do not show. In the case of floor plans, we have the length and the depth but not the height of the house; and in the case of the elevations, the length or the width and the height but not all three at once. The plan, in other words, shows what

there would be of the house if it were sliced open horizontally at any one of the floors and looked down upon from a height. Perhaps the easiest way to understand the floor plan and see the relation of room to room, the location of windows, doors, and so forth, is to trace with a pencil a route beginning at the front door and so on throughout the house. Reduce yourself in imagination to the size of the pencil point and assume an abundance of curiosity about every square inch as you pass through it. Go through all the openings shown on the plans, but think of them as doorways, and erect walls for the partitions as you go. Try the doors and make sure that they swing the most convenient way; sit in front of the fireplace and see whether you find yourself in a passageway or in a comfortable, cozy backwater; stand at the kitchen cabinet

or at the sink and see whether you have good light; see how far you have to walk to put away the dishes or to get things from the icebox; think where the best views are and whether you can see them from the living-room windows; and so forth, and so forth. You can play this game almost indefinitely and should play it until you have lived in every part of every room and put all the furniture in its place.

To fit in your furniture cut diagrams of it out of cardboard at the same scale at which the plans are drawn, which is usually what is called one-eighth or one-quarter scale. One-eighth means that every eighth of an inch is equal to one foot; one-quarter, that every quarter of an inch is equal to one foot. Although an architect has a special scale to enable him to read plans quickly, an ordinary rule can be used for this purpose. The best way to get an idea of the actual size of the rooms, however, is to go on a measuring expedition. Equip yourself with a six-foot rule and measure your friends' living-rooms

or dining-rooms or bathrooms, as the case may be, until you find one that is approximately the size of yours, or one that is the size you want yours to be.

Elevations are misleading and do not give a true idea of the house as it will appear, for they are drawn as if the eye of the observer were on a level with the topmost line and at the same time on a level with the bottom line. In reconstructing the house in imagination, translating it to a three-dimensional mass of length, depth, and height, it is necessary to remember that in perspective the eye will see much less of

the roof and chimneys than is shown on

the elevation drawing.

There are various signs and symbols used on drawings that must be understood before the house can be completed in imagination in all its details. Two charts showing some of these symbols are reproduced on this page, one showing a common, although not the only, way of indicating different materials. These indications of materials have never been standardized and whatever method is adopted should be explained by a key drawn in the margin of the sheet after the fashion of the "index" printed on this page. The other chart shows the most common symbols used in residence work to indicate various

light fixtures, base plugs and so forth, recently adopted by the Institute of Electrical Engineering Standards and the In-

stitute of Architects.

The symbols on the plans on the eight following pages do not entirely agree with those on the chart, which are of very recent adoption. On these plans a base plug is represented by a rectangle with a branch connecting it to the wall and a floor outlet by a square with projecting rays from the corners. When a ceiling outlet is controlled by a switch a dotted line is drawn connecting the two. If a ceiling light is controlled by a drop cord a "D" is placed inside the outlet symbol.

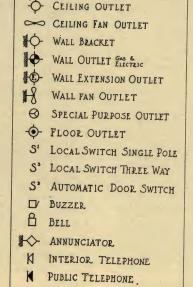
Double-hung windows on plans are shown by two parallel lines in the thickness of the walls, and casement windows and doors by a single line at an angle to the wall, the more acute

angle showing the direction of their swing. Sometimes the direction of the floor-framing is indicated on the floor plans but architects frequently make separate plans to show framing and in some cities, architects are required by law to do this.

The plans and elevations reproduced on the eight following pages are at approximately one-eighth scale, but not exactly; the details are at a larger scale. A special measure, however, might be constructed for each drawing based on any convenient figure given on the plan, such as, for instance, on page 27 the distance from terrace wall to the outside kitchen wall, which is 9 feet. A strip of paper marked off this length and then divided into nine parts would give the foot measurement that applies to the elevations and plans of this house.

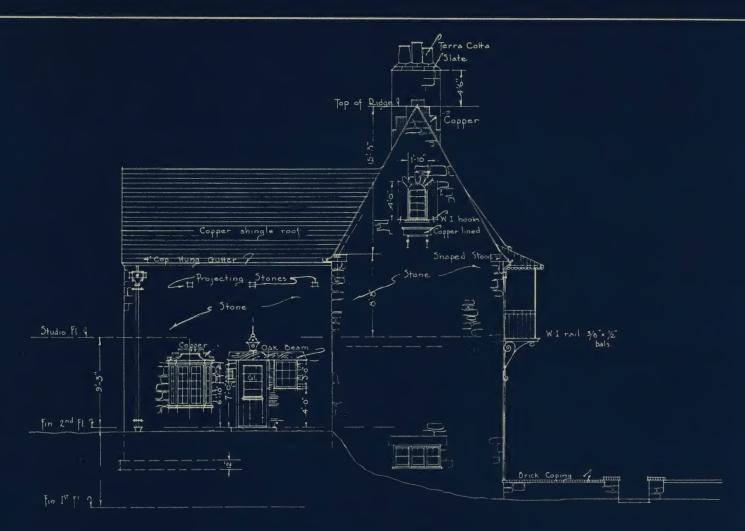
As all the plans and elevations which appear in the blueprint section are reproduced in exactly the same scale, this same measure will also apply to them, but to find the size

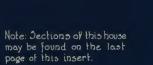
of any of the details which are given at larger scale adopt a new measure which in the same way can be found from any convenient dimension given.

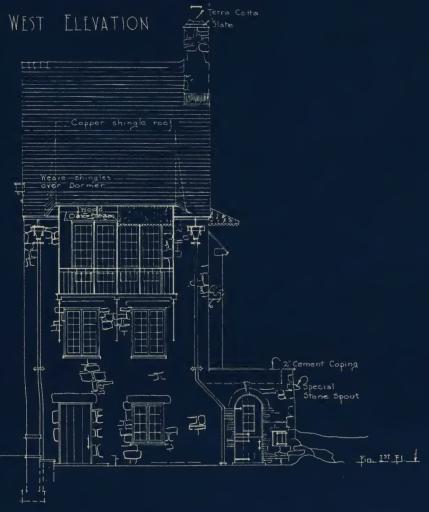


# PLANS ELEVATIONS and DETAILS

EASTERN AND WESTERN PRIZE HOVSES and a DVPLEX HOVSE



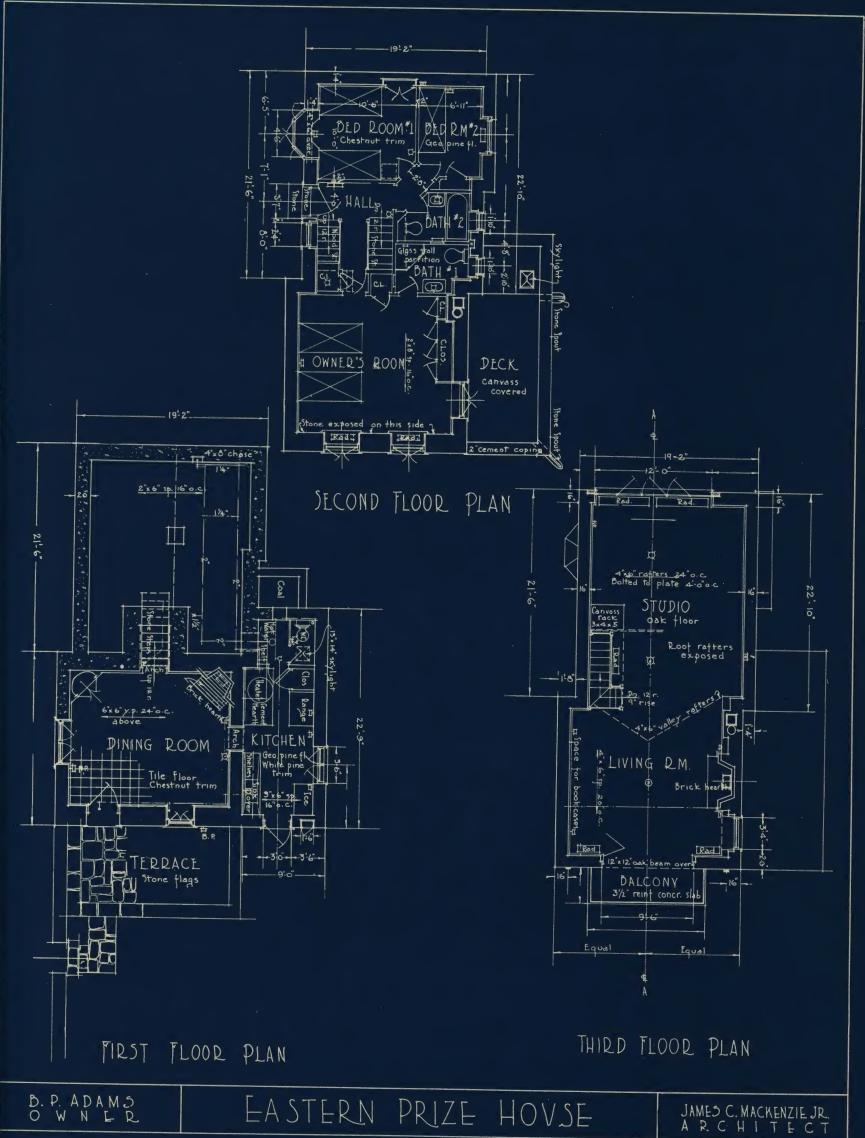


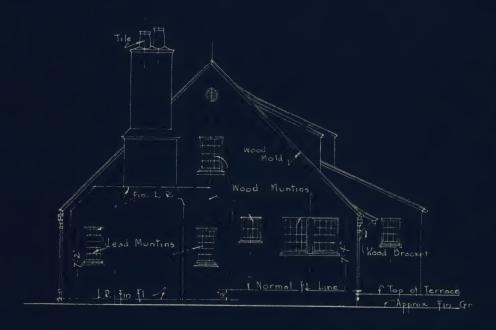


SOUTH ELEVATION

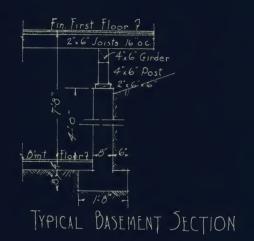
B. P. ADAMS OWNER EASTERN PRIZE HOVSE

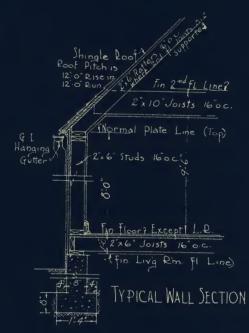
JAMES C. MACKENZIE JR. A R C H I T E C T

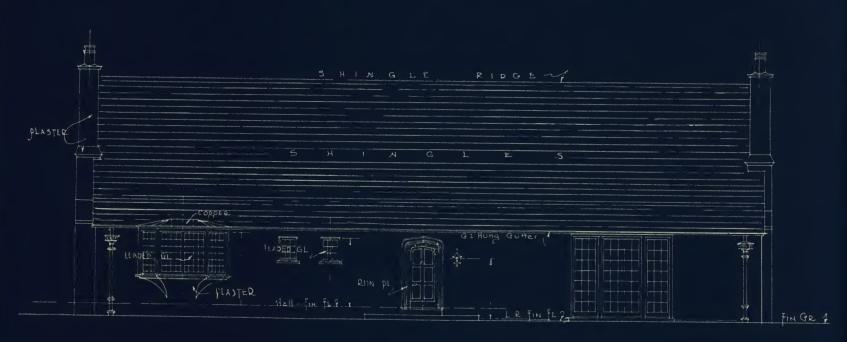




# NORTH ELEVATION



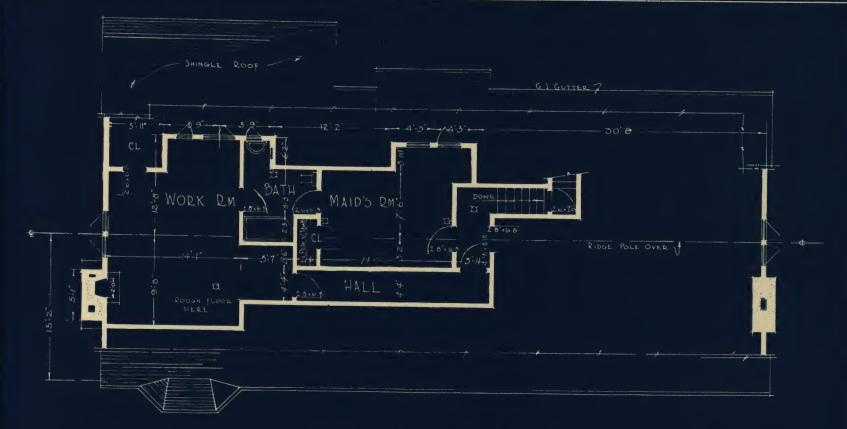




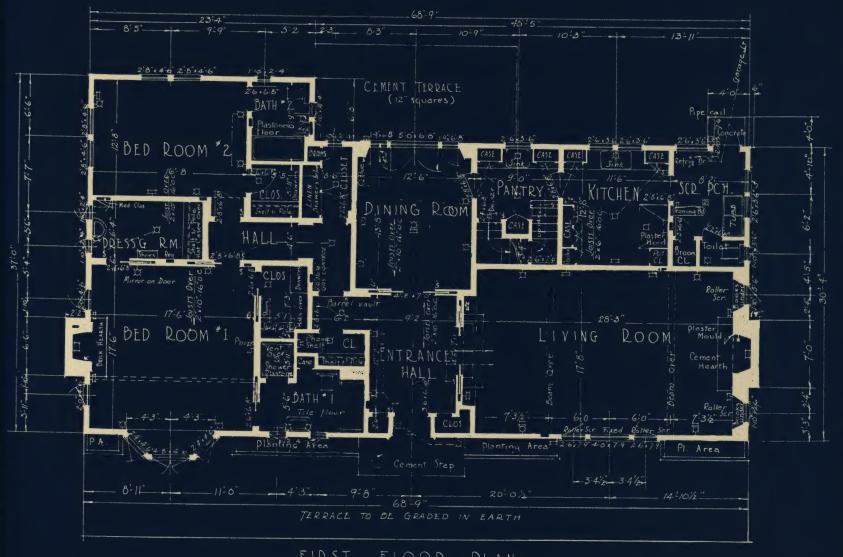
EAST ELEVATION

GEORGE 5. HVNT OWNER WESTERN PRIZE HOVSE

MARSTON —VAN PELT &MAYBURY—ARCHITECTS



SECOND FLOOR PLAN

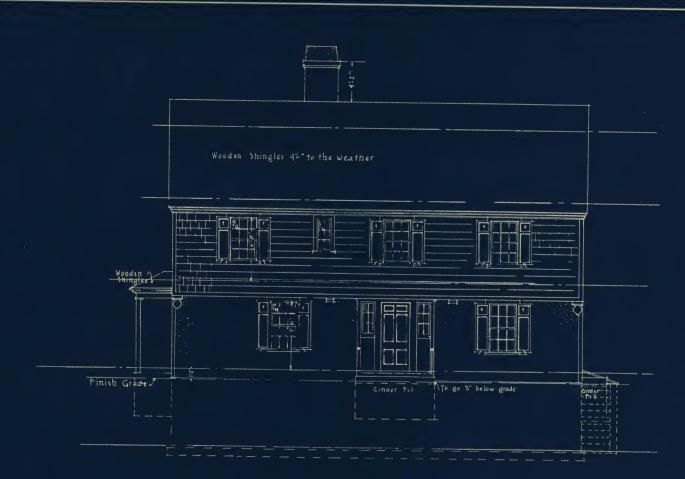


FIRST FLOOR PLAN

GEORGE 5. HVNT OWNER

WESTERN PRIZE HOVSE

MARSTON - VAN PELT &MAYBURY-ARCHITECTS



FRONT ELEVATION

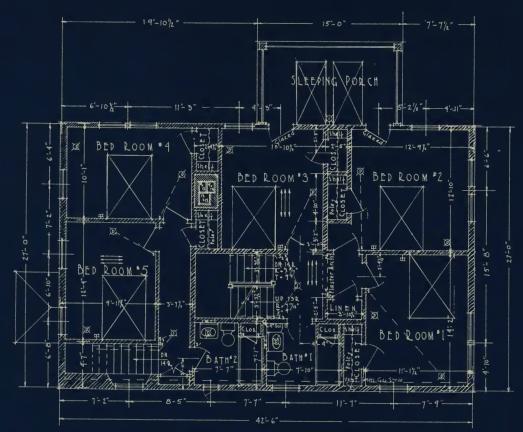


SIDE ELEVATION

DESIGNED FOR THE HOVSE DEAVTIFYL

A DVPLEX HOVSE

DY THE HOME DVILDERS SERVICE DUREAU





DESIGNED FOR THE HOUSE DEAVTIFUL

BY THE HOME DVILDERS SERVICE DVREAV



THE HOUSE OF CHARLES T. McManus, Esq.

DINING DM

HALL

LIVING PM

HALL

PANTRY

PANT

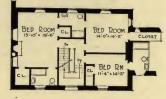
FIRST FLOOR PLAN

Germantown, Pennsylvania

MELLOR, MEIGS & HOWE

ARCHITECTS

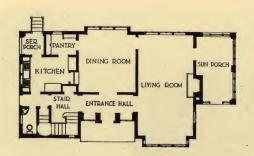




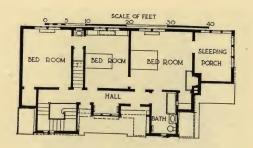
SECOND FLOOR PLAN

THIS HOUSE IS A MOST INTEREST-ING EXAMPLE OF ONE DESIGNED ESPECIALLY FOR A DEFINITE AND UNUSUAL LOT. THIS LOT, ABOUT AN ACRE IN EXTENT, SLOPES AWAY FROM THE STREET AND THEN DROPS ABRUPTLY IN THE REAR. THE HOUSE WAS PLACED AT THE POINT OF THE GREATEST CHANGE IN GRADE AND AT SUCH AN ELEVATION THAT IN THE REAR THE FIRST FLOOR IS ON THE LEVEL

OF THE GROUND, WHEREAS IN FRONT IT IS THREE FEET BELOW THE GROUND LINE. THE TWO PHOTOGRAPHS MAKE THIS CLEAR AND A STUDY OF THE PLANS SHOWS ALSO THAT THE MAIN ENTRANCE IS ON THE STAIR LANDING EIGHT STEPS ABOVE THE FIRST FLOOR. THIS SKILFUL ADAPTATION TO SITE HAS RESULTED IN A HOUSE OF GREAT ATTRACTION AND INDIVIDUALITY



FIRST AND SECOND



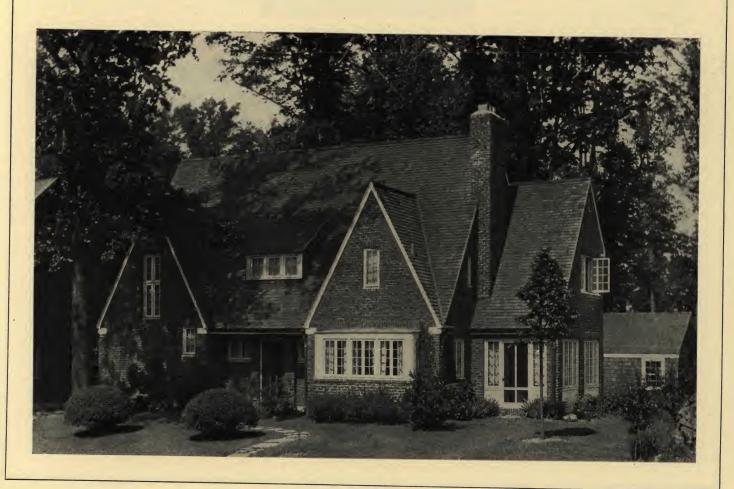
THE HOUSE OF LELAND H. LYON, Esq.

New Rochelle, New York

LELAND H. LYON, ARCHITECT

THIS HOUSE, OF FRAME CONSTRUCTION WITH A VENEER OF CLINKER BRICK, IS OF PLEASING PROPORTIONS. ITS END GABLES EXPRESS THEIR DIFFERENT USES IN A STRAIGHTFORWARD MANNER AND, ALTHOUGH NOT SYMMETRICAL, DO NOT DETRACT FROM THE APPEARANCE OF THE HOUSE. THE HOUSE IS DESIGNED FOR A FAMILY OF FOUR, INCLUDING TWO SMALL CHILDREN FOR WHOM THE PLAN IS ESPECIALLY ADAPTED. ALSO IT IS PARTICULARLY WELL ORIENTATED, AS ALL THE BEDROOMS, FACING EAST, RECEIVE

THE EARLY MORNING SUN AND YET ARE PROTECTED BY THE HALLWAY FROM THE HOT AFTERNOON SUN OF SUMMER. WINDOWS IN THE HALL ALLOW CROSS DRAFTS IN THESE ROOMS. THE RELATION OF THE KITCHEN TO THE FRONT STAIR HALL, SIDE ENTRANCE, AND SERVICE ENTRANCE IS PARTICULARLY GOOD. THE SIDE DOOR, WITH LAVATORY CLOSE BY, MAY BE USED BY THE CHILDREN AND AS THE DRIVE TO THE GARAGE IS ON THIS SIDE OF THE HOUSE, IT MAKES A CONVENIENT AUTOMOBILE ENTRANCE

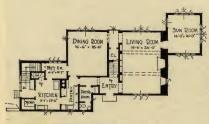




THE HOUSE OF ALBERT GUINN HOPE, Esq.

Knoxville, Tennessee

JOHN F. STAUB, ARCHITECT



FIRST FLOOR PLAN

THIS HOUSE WAS GIVEN A VERY SPECIAL COMMENDATION BY THE JUDGES OF THE HOUSE BEAUTIFUL SMALL-HOUSE COMPETITION, WHO EXPRESSED UNANIMOUSLY THE OPINION THAT IT IS A BEAUTIFUL SOLUTION OF AN AVERAGE PROBLEM. OF SIMPLE LINES THAT EXPRESS THE PLAN IN A STRAIGHTFORWARD MANNER, SHORN OF ELABORATE AND MEANINGLESS DETAIL, THE HOUSE HAS A GRACIOUSNESS THAT IS VERY APPEALING

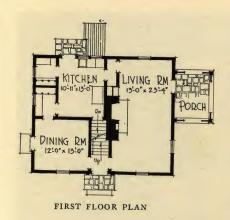




SECOND FLOOR PLAN

A STUDY OF THE PLAN SHOWS AMONG OTHER THINGS A WELL-PLACED BREAKFAST-ROOM, A CONVENIENTLY SITUATED DRESSING-ROOM AND LAVATORY, AND A MAID'S ROOM AND BATH ENTIRELY SEPARATED FROM THE REST OF THE HOUSE, AN EXCELLENT ARRANGEMENT WHEN THERE ARE NO CHILDREN. THERE IS A GARAGE IN THE BASEMENT, SO THAT THE REAR OF THE LOT, SLOPING DOWN HILL, CAN BE GIVEN OVER TO THE GARDENS

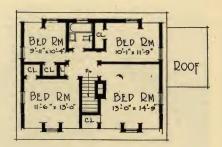
## TEN SMALL HOUSES



THE HOUSE OF ALLAN MACDOWELL, Esq.

Kent, Connecticut

CHARLES WELLINGTON WALKER,
ARCHITECT



SECOND FLOOR PLAN



THIS GAMBREL ROOF HOUSE OF EXCELLENT PROPORTIONS AND DETAIL WAS DESIGNED FOR A MASTER OF A PREPARATORY SCHOOL WHOSE FAMILY CONSISTS OF FOUR MEMBERS. A SINGLE CHIMNEY, CONCENTRATION OF PLUMBING BY PLACING THE BATHROOM OVER THE KITCHEN, AND THE REDUCTION OF HALL SPACE TO A MINIMUM HAVE HELPED TO KEEP THE COST OF THIS HOUSE TO A LOW FIGURE, YET EVERY-

THING HAS BEEN DONE IN THE WAY OF USING APPROPRIATE DETAILS BOTH WITH-IN AND WITHOUT TO MAINTAIN THE COLONIAL CHARACTER. IT IS PAINTED WHITE, WITH FLUSH PANELED SHUTTERS OF ROBIN'S-EGG BLUE. THE WOODWORK ON THE INSIDE IS PAINTED WHITE, WHILE EXPOSED BEAMS AND A FIREPLACE OF OLD BRICKS SALVAGED FROM A FALLEN HOUSE ADD COLOR AND CONTRAST

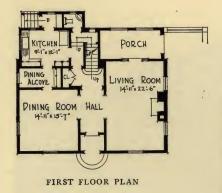




THE HOUSE OF STEPHEN PICHETTO, Esq.

Fieldston, New York

DWIGHT JAMES BAUM, ARCHITECT



IT IS FITTING THAT THIS HOUSE, DESIGNED FOR AN ARTIST WHOSE BIRTH-PLACE WAS ITALY, SHOULD BE ITALIAN IN CHARACTER. THE NECESSITY OF KEEPING THE COSTS TO A LOW FIGURE DETERMINED A SQUARE PLAN AND FURTHER FIXED ITS ARCHITECTURAL EXPRESSION. PERFECTLY PLAIN EXCEPT FOR THE STRING COURSE AND

QUOINS, BOTH OF STUCCO, THE HOUSE



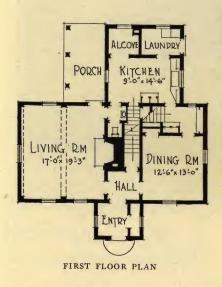


SECOND FLOOR PLAN

OWES MUCH OF ITS ATTRACTIVENESS
TO ITS FINELY PROPORTIONED AND
WELL-SPACED WINDOWS AND ITS SYMMETRICALLY PLACED CHIMNEYS. AS
THE HOUSE FACES A MAIN STREET THE
PORCH IS AT THE REAR OVERLOOKING
THE GARDENS. THE BEDROOMS ALL
HAVE CROSS DRAFTS AND THE DININGROOM ON THE NORTHEASTERN CORNER
CATCHES THE MORNING SUN

#### TEN SMALL HOUSES

A HOUSE THAT IS CARRIED OUT IN THE SPIRIT OF THE EARLY COLONIAL AND YET THAT IS IN NO SENSE A COPY. VERY DEFINITE REQUIREMENTS WERE MADE FOR ROOMS FOR THREE CHILDREN, ONE LARGE ENOUGH TO SERVE AS A PLAYROOM, AND AN EFFICIENT SERVICE PORTION WITH A LAUNDRY ON THE FIRST FLOOR, BUT THE ARCHITECTS WERE LEFT FREE TO EXPRESS THE PLAN IN A MANNER THAT SEEMED BEST AND THAT WAS YET CONSISTENT





THE HOUSE OF CHARLES F. GREENE, Esq. Winchester, Massachusetts

DERBY & ROBINSON, ARCHITECTS

BED DM BED DM 9'-6"x 12-'0" 8'-0"x 12-'0"

WITH LOW COSTS. AN AMPLE LIVING-

ROOM TAKES CARE OF FREQUENT

INFORMAL GATHERINGS; A SPECIAL

ENTRANCE WITH LAVATORY NEARBY

PROVIDES FOR THE EASY COMING AND

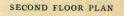
GOING OF CHILDREN, AND A HALF

FLIGHT OF STAIRS FROM THE PAN-

TRY TO THE LANDING OF THE MAIN

STAIRS ALLOWS THE MAID TO GO TO

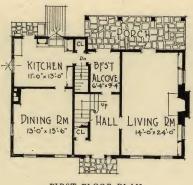
HER ROOM ON THE THIRD FLOOR



BED ROOM







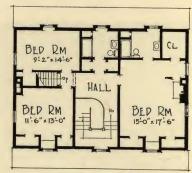
FIRST FLOOR PLAN

THE HOUSE OF
WILLIAM S. STAIR, Esq.

Bellerose, Long Island

LEWIS E. WELSH

ARCHITECT



SECOND FLOOR PLAN

THE DUTCH COLONIAL IS A POPULAR TYPE OF ARCHITECTURE FOR THE SMALL HOUSE, BUT IT HAS BEEN SO BADLY ABUSED THAT IT IS A PLEASURE TO FIND A HOUSE THAT INTERPRETS ITS SPIRIT AS WELL AS DOES THIS ONE. WITH AN EXCELLENT ROOF-LINE, DORMERS WELL SUBORDINATED TO THE WHOLE MASS, AND WELL-PLACED WINDOWS, IT IS AN EXCELLENT EXAMPLE OF A STORY-AND-A-HALF HOUSE PROPERLY TREATED. ALTHOUGH SMALL IN APPEARANCE, IT HAS A GOOD-SIZED LIVING-ROOM AND BREAKFAST ALCOVE, AS WELL AS A KITCHEN AND DINING-ROOM ON THE FIRST FLOOR, THREE BEDROOMS AND TWO BATHS ON THE SECOND FLOOR, AND SPACE FOR A MAID'S ROOM AND BATH ON THE THIRD FLOOR

## THE SITE

THE preceding chapters dealt with general considerations and with what might be called the personnel of house-building. This chapter and the two following discuss the details and the materials. No attempt is made to advise on how the home should be planned or how it should look. Even in considering the house in relation to the lot, it will be treated more from the contractor's point of view than from that of the artist.

Certain problems of beauty and comfort, nevertheless, are bound up with crassly practical matters, and these must receive priority of consideration.

## ÆSTHETIC CONSIDERATIONS

Plot Plan. — The lot must be considered as a whole. The relation of the garage, gardens, laundry yard, drives, and walks must be thought out, as well as the house itself. The amount of grading must be visualized, and, if a landscape architect is to be consulted, now is the time rather than when the house is completed.

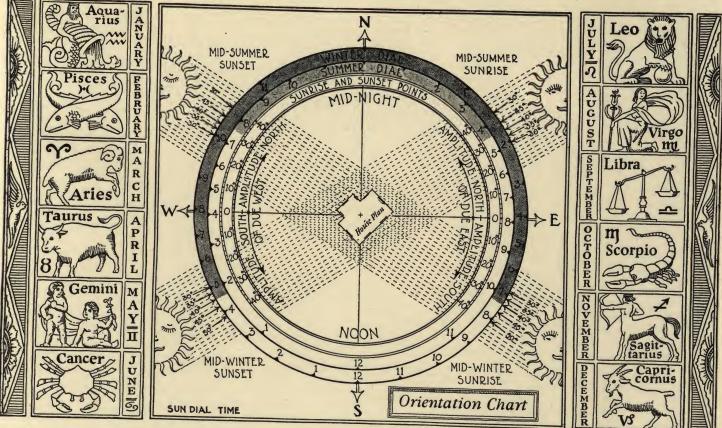
Orientation. — The orientation of the house, that is, its relation to the points of the compass, comes next. For

instance, in most states morning sunlight is desired in the dining-room and afternoon shade on some porch. Remember that in all-the-year houses a southerly exposure is peculiarly desirable.

Winds. — The prevailing winds should be considered. Summer bedrooms need cool breezes, but bathrooms should not be exposed to winter gales, and the kitchen wing should not be to windward of the parlor.

Vistas. — Vistas and screens must be kept in mind. If there are attractive views, the house should be placed to take advantage of them. It should itself be placed to appear to best advantage. Conversely, if the surroundings are uninteresting, or if it is desired to mask the house from the public, careful consideration should be given to the "lay of the land" and the possibilities of planting screens of trees and shrubs.

Trees. — Trees should be saved, as far as possible. It is comparatively easy to cut down a tree or a shrub, but it is a matter of considerable expense or many years to replace it. This word of warning is urged on the reader's attention. If there are any trees of beauty in themselves, or desirable as shelter from sun and wind, or as a frame for the house, or in a



### Orientation Chart

This chart was designed to show the location of the rising and setting sun, both in summer and in winter, with a key for adjustment to the different degrees of North Latitude. The chart is adjusted for a midsummer and a midwinter day on the fortieth degree of North Latitude, which is the average line midway through the United States from ocean to ocean. To orientate your house, cut a cardboard plan of it similar in scale to the one shown. Attach it with a pin at the centre of the chart. First place your house facing directly east. You will see that on a midsummer day the north and east elevations will get the first morning sun. About 8 o'clock the sun will leave the north side and begin to illuminate the south elevation. At noon, the sun will pass from the east to the west side of the house, and then, between 7 and 8 o'clock



A Sloping Lot

Irregularity of terrain is an advantage if skillfully handled, as it suggests picturesque treatment. Here the uneven roof lines and the terrace walls tie the buildings into the land so that they seem a natural growth in perfect harmony with the setting. The drive has been located to take advantage of the existing oak trees. Its gutter is rough-set and natural. H. T. Lindeberg, Architect

particular view from the house, their preservation and position may actually determine the location of the new building.

### PRACTICAL CONSIDERATIONS

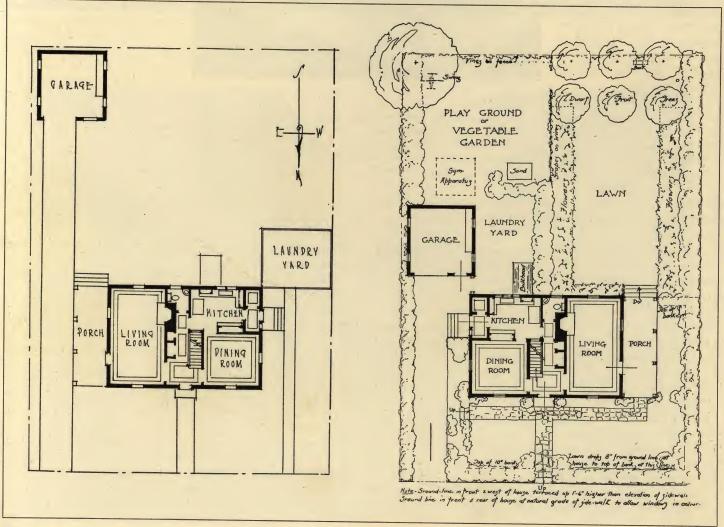
Of the more definitely practical considerations, important ones which must be treated in the contract specifications are: the character of the ground below the surface; the disposition of the topsoil; drives, walks, terraces, and the like; arrangements for linking up with the water, gas, electricity, telephone, and with the sewers, cesspools, or other means of disposal. This last subject is discussed in later chapters.

Subsoil. — In planning the house, consideration should, of course, be given to the subsoil: that is, whether there are large boulders or ledge rock, removal of which would require expensive drilling and blasting, or whether quicksands or deep "made" or "filled" land exists, where costly piles or piers are needed. On the other hand, the underlying material, if of sand or gravel of good quality, may be used in the mixing of concrete and mortar and for future filling around the house; or, if the subsoil has much loam on it, the top should be saved for surfacing of terraces and gardens. In either case future disposal should be noted in the specifications. The owner should see to it that the dumps for excavated material should be plainly indicated by stakes or signs.

One or more test pits should be dug to the depth of the foundations. Samples should be preserved for reference, and the attention of estimators called to the existing condition, so that they may be held responsible later.

Underlying Rock. — If there is much underlying rock which it is economically advisable to use in the construction of the building itself or of terraces and roadways, it may be advisable to excavate under the entire first floor, whether the cellar room is needed or not. If the rough broken rock is not needed, it will be cheaper to make the greater part of the cellar a shallow air-space, and excavate only as needed for furnace and storage.

Unit Prices. — The character of the subsoil should be described with reasonable exactness, and the use or disposal of the excavated materials should be specified, to allow the contractor to estimate closely. When this cannot be done, it is customary to establish beforehand unit prices per cubic yard, covering the cost of the removal of loam, of sand and gravel, and especially of boulders up to 3' maximum dimension, and for the blasting and removal of larger boulders or ledge rock. With these prices established, it is comparatively easy to check the amount of work as it progresses, or estimate it when the excavation is completed. The unit prices are listed among the other allowances, or are included in the pages on Excavation.



Plot Plans

These sketches indicate a stiff and unimaginative arrangement on the left, and a carefully studied composition on the right, where the garage is tied in with the service portion of the house and masks the vegetable garden and laundry yard, while to the west the lawn has been developed for seclusion and is bordered by flower beds. It will be noticed that the house plan on the right is reversed so that the dining-room will receive the sun in the morning and the living-room will have it in the afternoon

Depth of Cellar. — Some architects recommend building the house directly on the ground with no air space at all, but unless the conditions of climate and soil are favorable, as in the South, there is in this a danger from dampness and no appreciable saving in cost.

In states where there is a chance of frost penetrating into the ground, it is essential that the foundations be carried down below the frost line. If for this reason they are extended about 4' below the finished outside grade, then the expense of a few more feet of excavation and foundation walls is worth while on account of the cellar-space made available.

Two elements must be considered in this matter: the artistic, which determines the grade of the main floor in

relation to the exterior, and the economic, which calls for equalizing the amount of "cut and fill"—that is, the excavated material from the lot and the material to be used for filling the hollows or for building terraces.

The owner must remember that carting soil or filling from place to place is very expensive. If he contemplates terraces, or a driveway to his front door, the material taken from the cellar is evidently made to his hand. It may be just as cheap to dig it from the cellar as to haul it from some distant place.

Some types of architecture derive their charm from placing the first story practically flush with the ground, while, in others, a certain amount of light and air is demanded for the basement. If plans

are so drawn that earth excavated can be used for all the filling needed around the house, then a real saving in expense is made.

Staking Out. — After the contract has been let, the exact location of the house on the lot may be laid out by a surveyor, employed by the owner or by the contractor. Where the land is limited and the house bears a fixed relation to the "party" lines — that is, the boundaries to the adjoining properties — and to the sidewalk lines, the official dimensions and angles of the corners should be drawn on the lot plan, and the contractor should be held responsible for observing them. Where the land is extensive, it may be advisable to rely on staking out the corners of the building and adjusting the vertical levels to the actual contours of the ground.

Batter Boards. — Outside the four main corners of the future house batter boards are erected, which consist of stakes driven into the ground, with boards nailed to them approximately at right angles, 3' or 4' above the sod. On these boards are marked with the utmost accuracy the different fronts of the future house, so that cords, when stretched from one batter board to another, will indicate the outline of the walls.

Bench Mark. — In town or suburban building the "base," or official starting-point for vertical dimensions, is taken from some fixed point, the elevation of which is given in the records. It may be the corner of the curbstone, a manhole cover, or a near-by building, and with the aid of a surveyor's level the

heights or grades called for on the plans may be brought into true relation.

In the country, where there are no sewers or sidewalks already installed, the height of the future floor-levels is determined in relation to a natural object such as a ledge, or the base of a tree. However these data may be determined, it is customary to refer to the official mark which the contractor is to follow as the "bench mark."

Shoring. — Sometimes when the ground is not firm it is necessary to take certain precautions by installing "shoring" and "sheet-piling," which are wooden retaining walls, well braced to prevent the banks from falling into the trenches.

Removal of Loam. - Loam, sod, or peaty soil should first

be removed from the site of the building and any filled terraces, roadways, and the like, and it should be stacked in a convenient location. This is done for two reasons: first, as such materials, filled with decomposed vegetable matter, are unsuitable as a base for construction or driveways; and second, because of their intrinsic value for use on future lawns or gardens.

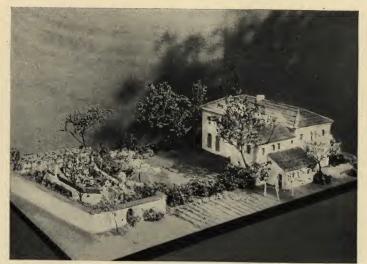
Approaches. — In cases where the contractor, in order to reach the work, must spend any considerable amount of time or money in preparing a roadway for hauling his material, it is more economical to have the driveway included in his contract, so that there shall be no duplication of effort — which eventually is paid for by the owner — and so that trucks

and teams shall follow the line of the future driveway and not cut up and disfigure needlessly the turf, shrubs, and trees by their necessary carting.

Protection of Trees. — The amount of land which the contractor may use for his operations — "job office," storage shed, and stacks of materials — should be noted before the agreement is signed. The trees and shrubs which are to be removed on the site of the house or drives should be described; those within the field of operations which are to be preserved should be marked and protected. Board shields should be built around the trunks of trees to protect them from excavated material, bricks, and the like, which would stifle a tree or injure its bark. If it is necessary to remove limbs it should be done under supervision, so as to damage the tree as little as possible, and the wound should be cared for by painting, to prevent decay.

Removal of Water. — A clause should be inserted in the specifications placing on the contractor the responsibility for the pumping out of water which may appear in the excavations, either from rain or from underground sources.

Grading and Planting. — The walks and drives, the distribution of loam, the preparation of planting-areas, and even the seeding and care of lawns may be included in the actual work to be done by the general contractor; but their consideration comes more properly under Landscape Architecture than in a discussion limited to housebuilding, as they are usually done under the supervision of a landscape architect.



A Plot Model

To determine the most economical use of the grounds, make a model of the proposed layout. This model shows the garage and vegetable garden well screened from the lawn and an enclosed garden balancing the house. Designed and made by Edwin Mitchell Prellwitz



The Value of Trees

These poplar trees have been planted not in this instance for shade, but to give a vertical accent to a composition in which the lines are mainly horizontal. Imagine them away and you will see how much they add to the picture. John F. Staub, Architect



A Grass Terrace

This terrace of grass, beyond which the land falls away abruptly, gives a pleasant platform for the house to rest on and also provides an uncovered place for promenading or sitting. William T. Aldrich, Architect

# **FOUNDATIONS**

HE character of the foundations of a building is declay, when it is more liable to give. If "made land" (that pendent on the subsoil, on the loads they are to carry, and on the materials which are to be used in their construction.

The foundations, in the usual terminology, include the walls up to the level of the outside finished grade, and often the walls from grade up to the first-floor level. The term also includes the "footings," that is, the actual bearing-surface of the foundation walls, which are increased in width to give a wider and more suitable base. The term also includes posts, whether of masonry or wood, which are carried down not less than three feet into the ground to support small, light cottages, and piles, which may be 30' long, of spruce or pine or concrete, which are used under heavy loads to be placed on soft filled land, quicksands, or boggy subsoil. It is inadvisable to use wood posts except in temporary sheds, as the moisture in the ground and the lack of air cause decay. Stone, brick, or concrete posts for cottages should be carried well below frost line, should be solidly constructed, and should be placed close enough together to avoid settlement. False economy in foundations is doubly dangerous, as it is hard to remedy defects at a later date. The consideration of deep piling is beyond the province of this elementary manual.

Below all exterior foundation walls, interior "bearing" partitions (that is, walls which support the ends of the first-floor framing), and piers or posts in the cellar, there should be footings, preferably of concrete, except when such walls and piers rest on solid rock. If the ground on which these are to rest is a natural subsoil and of a compact sand or gravel, the footing must be from 4" to 6" wider on each side than the masonry it supports, and from 8" to 12" thick. If the subsoil is clay, the footings should be larger, especially if there is a likelihood of there being moisture in the

is, where it has been filled in artificially), or if a loamy soil exists, it is advisable to dig down through it; but if this

is out of the question the footings should be made considerably wider and well reënforced, and should be bridged over any soft pockets which might cause settlement and so cracks through all the walls and plastering of the house.

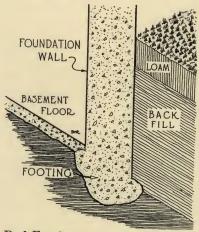
It often happens that the entire building may settle slightly; but if this settlement is even, no particular disadvantage occurs. If a general settlement at one end occurs, the results are not so bad as from a fracture due to an acute local settlement; but even then it should be avoided. For this reason special precautions should be taken in the way of stronger footings, with additional reënforcing rods, where the foundations extend from one subsoil to another - as, for instance, if part of the building rests on rock ledge and the rest extends over gravel. Footings should not be laid on a slope, as this would involve the danger of slipping; they should be carried down in successive steps.

When there is much underground water it is well to lay land-tile drains with open joints around the outside of the footings and cover them with broken rock. The line should be carried off underground to a lower level, where the water can seep off with no danger of its backing up to the cellar level.

# FOUNDATION WALLZ BASEMENT FLOOR BACK FILL S FOOTING DRAIN TILE STONE FILL

#### Good Footings

The support for the foundation wall is shown extending out four inches on each side with a square solid base which was cast in wooden forms. On the outside is a tiled drain with open joints, packed in broken stone



#### Bad Footings

Here the support for the foundation wall is inadequate and so the entire house is built insecurely. Its depth and span are irregular and its under side is curved. It is liable to settle unevenly and cause cracks in the superstructure

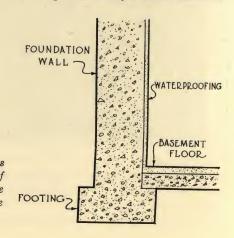


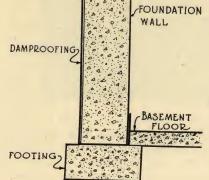
On the left is shown a waterproofing laid on the footings before the wall was poured, and extended up the sides of the foundation wall after it was in place. On the right the basement floor and the inside of the foundation walls have been coated with a cement waterproofing

#### **MATERIALS**

In different parts of the country special conditions have developed different practices with regard to the materials to be used for foundation walls, but stone, brick, and concrete all have their uses.

Stone. — Where field stone or easily split rock is available it forms an excellent and economical foundation wall; but the stones should be well laid in cement mortar, composed of one part cement, a small amount





#### FOUNDATIONS

of *lime-putty*, and *three parts coarse sand*; and no voids should be allowed in the joints. Both sides of the wall should be pointed up on completion.

A stone cellar wall should be at least 18" to 20" thick, both for strength and because the cost of laying anything less increases rather than diminishes, owing to the greater labor required in selecting and fitting the stone within narrow limits.

Brick.—Brick is also a familiar material for foundation walls, of which the enduring qualities are unquestioned. The high percentage of its use in early American houses which are still standing proves its value. The selection of material for this purpose, as has been said, is advisedly dependent upon local conditions.

Concrete. — A concrete wall, for light wood construction, may be cut down to 12" in thickness, or even to 8" in some instances. If, in places, there is a moderate "lateral thrust," or pressure from outside earthwork, reënforcing rods of steel should be placed in the forms, and so incorporated in the concrete wall. Often an added 4" of thickness in the concrete is cheaper than reënforcing. Concrete is better than stonework, in that: (a) in most parts of the country it can be built more cheaply, depending on the local materials; (b) the finished interior surface will be more even, and therefore desirable if the cellar space is going to be utilized; (c) if properly constructed, and especially if reënforced by horizontal rods, it will resist local settlements because more homogeneous; and (d) it can be more readily waterproofed if required.

The thickness of the walls increases from the two minimum sizes of 18" for stone and of 8" for concrete to whatever thickness calculations or experience show to be required for the depth of the foundations below the grade and the weight of the building to be supported. It is advisable to have the foundation walls up to the first-floor level at least 4" thicker than any masonry walls above them.

Concrete blocks are used to good advantage for foundation walls in localities where they are easily obtainable.

MIXING CONCRETE. — The concrete for foundation walls should consist of one part high-grade, well-seasoned, true American Portland cement, of a standard brand, which should have been kept dry until used; two and a half parts sand, which should be coarse, sharp, and free from any loam or salt; five parts stone, which should be clean, crushed traprock or granite, or clean gravel screenings, with the minimum diameter of 1" and a maximum diameter of 2"; and seven gallons of water to each bag of cement. The solid materials should be measured out in an open frame or bin before mixing. If small field-stones are abundant, the contractor may be allowed to place them in the forms of 14" or more thick as the concrete is being poured, but only on condition that such stones are free from any dirt or loam (which prevents the proper adhesion of the cement); that they shall not fill more than three quarters of the thickness of the wall (in order to keep the concrete homogeneous); and that they shall not come within six inches of each other horizontally or within one foot of each other vertically. The materials should be carefully measured for each batch which is to be made; they should be thoroughly mixed before the water is added, and then turned over several times to ensure that the cement covers every surface of the sand and rock.

The concrete should be stirred up, preferably in a machine mixer, if one is available or the size of the work justifies such a requirement. If it is mixed by hand, precaution should be taken not only that the materials are properly proportioned and turned over at least three or four times, but that the water should not be allowed to run off except into the forms. As the semi-liquid material is dumped into the wooden



Concrete Mixer

Here the drum in which the cement, sand, and water are mixed has just been tipped to empty the concrete into the wheelbarrow



Pouring Concrete

Here the wheelbarrow load is being dumped into the wooden forms and prodded to ensure even settlement



Rough Concrete

The forms have just been stripped, leaving the exposed ends of the wires which help to hold the form in place. The wood frame for the basement window was set in the forms and the concrete poured around it

forms it should be tamped or rammed — that is, thrust into position with a spade or stick, so that no empty pockets will be formed by the larger stones piling together and not



Well Planted Foundations

A house should be placed low upon the ground and it should be planted just sufficiently to establish its relation to it. This does not mean smothering or even entirely masking its base with vegetation. On the contrary, there should be evidence here and there of the penetration of the walls into the solid earth. H. T. Lindeberg, Architect

settling into all the corners. It is best not to pour a layer more than three feet deep at one time, because otherwise the heavier stones would settle to the bottom and the cement and sand rise to the top. At the vertical end of a section which is poured, the surface should be "keyed," that is, have a vertical recess left the full height, so that the next section to be poured will lock in with it and prevent a joint passing straight through the wall.

Before the next layer of concrete is poured on one which has already set, special care must be taken that the top surface of the lower is clean, in order that there may be a perfect bond between the old and new. It is very easy for dust or shavings to fall into a mould overnight, and these should be all swept out. If a considerable time has passed, it is well to mop the horizontal surface of the old concrete with "grout," that is, a liquid paste of cement and sand with sufficient water

to make it flow into all the minute depressions.

forms for concrete walls. — A concrete wall is made by pouring the material, as soon as mixed, into wooden forms. These are built up so that the inside surfaces are the exact dimensions of the finished wall. They must be carefully braced and supported on the outer sides to withstand the weight of the concrete mass, and matched boards with tight joints must be used to prevent the sand and cement from draining out through the cracks, leaving empty spaces between the pieces of stone or "aggregate." Wire ties should be run from side to side of the mould every three or four feet as an additional safeguard to prevent the forms from getting "out of true." When the boards are stripped from the concrete, these wires are cut off flush with the surface of the masonry and left embedded in it.

Any irregularities in the boarding will leave their imprint on the surface of the concrete after it is dry. This does not matter on the outside of the wall, where it is to be buried underground or covered with a cement or stucco finish, nor on the inside of the wall if it is to be exposed in a coal pocket or an unfinished cellar. If, however, the concrete wall is to be exposed in a laundry or garage, where a smooth surface is desired, all boards used in the form should be matched and planed and carefully assembled, and there should be a clause in the specifications that all "fins," or projecting ridges, should be cut off; all "holidays," or empty spaces, should be pointed up, that is, carefully filled with a cement and sand mortar applied with a trowel; and any serious defect in the

concrete should be cut out and patched.

Sometimes paper is used to line the form, to ensure a smooth surface; but this is not recommended, as paper often adheres to the concrete and is difficult to remove. Sometimes, if the boards of the form are not sufficiently smooth, they are oiled to prevent the cement adhering to them; but this stains the concrete.

FORMS FOR CONCRETE FOOTINGS. — When footings occur in a very compact sand or fine gravel, concrete may be poured in trenches which have been carefully cut to the dimensions of the finished masonry; but it is preferable to have the sides of boards rather than formed by the subsoil, as this prevents the sand-bank from breaking in and so forming pockets in what should be continuous concrete, and also prevents too much of the liquid part of the concrete from seeping away into the bank, and so altering and weakening the masonry when it is dried out.

It is well to leave the forms in place, especially in cold weather, until the concrete has received its final "set," that is

to say, is thoroughly hardened. In some cases, however, they must be removed while the concrete is still "green," as when certain finishes are to be given to the surface.

CONCRETE FINISH.—The treatment of a concrete wall which is to be exposed on the outside usually comes under one of two general headings: either (1) where the surface is cut or washed away to obtain the desired texture, or (2) where it is brush-coated with grout or covered with stucco. These treatments are discussed in detail under concrete in the chapter on Walls. Interior concrete walls, which are to be left exposed but which require more finished results than merely removing the defects, may be rubbed - usually with carborundum stone - and then painted, either with a cement grout (which is inexpensive but leaves a lifeless gray effect) or with the specially prepared paints for cement surfaces, made by the better manufacturers.

WATERPROOFING. - It often happens, owing to danger from underground water or from the leakage of rain water, that cellar walls and floors require either damp-proofing or more thorough waterproofing, according to the extent of moisture which must be excluded. In general these may be classified as membrane and surface treatments, and as integral treatment, that is, where the waterproofing material is blended with the concrete while it is being mixed.

Membrane and Surface Waterproofing. This consists of a continuous impermeable coating which seals the entire floor and walls up to the highest point where water may occur. There are various methods of waterproofing, and in many states there are companies that specialize in just this work and will install it under contract and give maintenance guaranties. Membrane waterproofing may be described as a tar- or pitch-impregnated coating which is laid continuously upon one masonry surface, and then, to protect it from fracture and also to prevent its yielding to pressure, has another layer of masonry, whether on floor or walls, placed

A simpler method of surface waterproofing is where the exterior of the foundations is covered with a waterproofing liquid, - sold under various trade-names with varying composition, - or where the masonry is merely mopped with hot tar. This is comparatively easily done for the walls, but it is obvious that the under side of the floors cannot be treated in the same way.

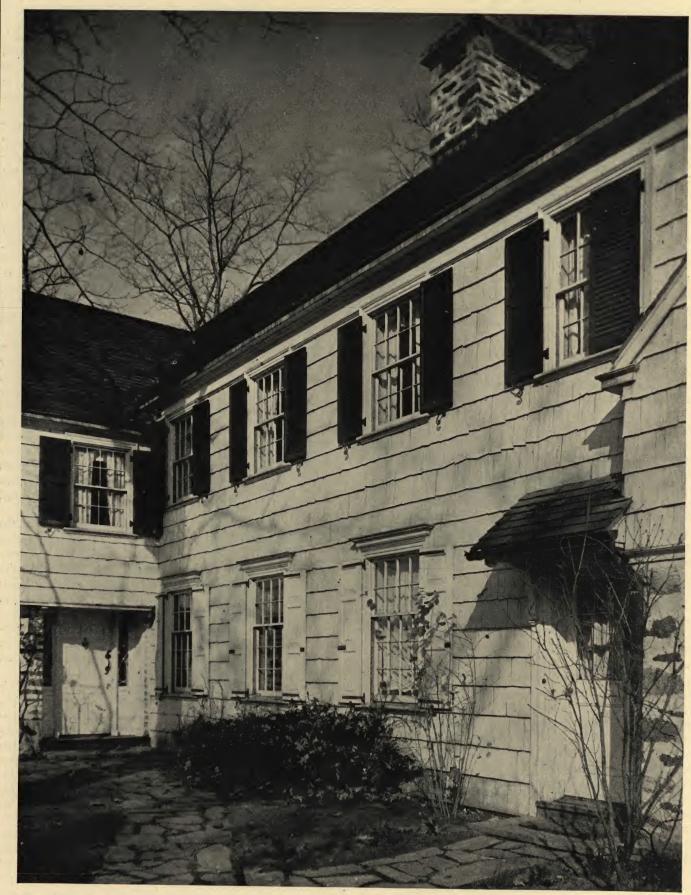
In buildings already completed, where there is a pronounced leakage in the cellars, waterproofing cements can be used which are coated over the interior of the walls and floors

from 1/2" to 2" thick.

Integral damp-proofing. In this process a chemical in powdered or liquid form is mixed with the concrete. The simplest of these — which is not controlled by any patent is hydrated lime. In the proportion of ten pounds to each bag of cement it should be thoroughly mixed with the dry concrete aggregate before the water is added. This is not an absolute waterproofing like some of the more expensive chemicals, but it is an economical and efficient method of making walls and floors tight against the normal amount of moisture in the soil during the rainy season.

In the average house, where there is no "head" of water to be contended with, such as would come from an underground spring or a cellar at the bottom of a hill, painting the outside of the walls with tar and using the inexpensive hydrated lime in the concrete itself will be found to give

ample protection.



Wood Shingles

The covering of this house helps definitely to establish its character. Wide wood shingles as used here are typically American and essentially domestic. With the beautifully moulded trim and the well designed shutters, they give the house real distinction. Heathcote M. Woolsey, Architect

#### VIII

## THE WALLS

HE material of the exterior walls is the salient characteristic of any house and gives the generic name, such as "a stone cottage" or "a brick house." A general classification includes wood, stucco, concrete, brick, and stone.

The choice of material depends on the available funds, adaptability to climate and surroundings, the style of architecture and the permanence of the building, and conformity with the fire-hazard laws.

Under average conditions the relative first-cost of the five types is roughly as they are listed above, with wood the least expensive. With stucco the price depends on the construction of the wall behind, whether wood-frame or masonry. Availability of material may also shift the order, as in the mountains, where stone is cheaper than brick.

The climate has an important bearing not only on the style of architecture but on the actual materials to be employed. As for example, stucco: if there are extreme changes in temperature, the cement and the base to which it is applied expand and contract differently, with the danger of cracking and peeling. In a smoky, sooty atmosphere a smooth surface stays presentable longer than a granular stone or rough stucco.

The house should be in harmony with the surroundings. A low shingled cottage is out of place in city suburbs; a Southern villa gives no sense of comfort in a leafless expanse of snow; and prim Colonial brick walls look pathetic in an untamed wilderness.

If a definite style of architecture is desired, not only the proportions and details must be followed to obtain the effect of the period selected, but also the materials of the walls and trim must be in harmony. Simple white Colonial farmhouses with green blinds, sheltered by elms, call for painted wood. Spanish patios under a hot sun suggest the clear tones and crisp texture of stucco. The mansions of Virginia demand a mellow brick, while the formal villas of French ancestry are best interpreted in cut stone.

#### WOOD

From earliest times wood has been and still is one of the chief materials used in home construction. Because of low first cost, ease of working, adaptability to many purposes, and the beautiful finish which many varieties take under the hands of skilled craftsmen, wood commends itself alike to the purse and the eye. In spite of the lessening gap between lumber prices and those of other materials, wood is still the cheapest material in first cost, and the durability of wood is sufficiently attested by the existence of many fine Colonial wooden houses still admired in their second century of use.

Of course these grand old houses have been excellently cared for by their owners, otherwise they would have vanished long since. For long life out-of-doors wood requires frequent painting or varnishing. When this and other upkeep expenses, such as insurance and fuel, are taken into account, it is probably true that in the long run a wood house is as expensive as a masonry house of fire-resisting material. Nevertheless, for the reasons cited above, wood will long continue the popular building material.

The covering may be of clapboards or siding, or of shingles; it may be partially of wood, as with half-timber, or built solid, as in the log-cabin.

Clapboards and Siding. — These names are loosely used and sometimes interchanged in different parts of the country. In general practice the first refers to boards about 51/2" wide, about 3/16" thick at the top, by 1/2" at the bottom, which are nailed on the rough wall-boarding, one above another, I" to  $1\frac{1}{2}$ " overlapped, and leaving an air space between them

and the wall. The second refers to heavier boards beveled at the bottom to allow for an overlap, so the back of the siding lies flat against the wallboarding.

Siding is made of lumber 7/8" thick and averages 8" wide, 1/4" thick at the top, and 7/8" thick at the bottom. The appearance of ordinary siding when in place varies little from clapboards except for being larger. Special effects, however, may be obtained by the use of "block siding" or of "beveled siding," where each strip is tongued and grooved at top and bottom rather than overlapping. The first was much in vogue in Colonial days, suggesting stonework. The second is seldom used now except for special effects, owing to its crude appearance and increased cost over what might be called the wide "matched boarding," used as the simplest form of siding where a plain flat effect is wanted.

Clapboards as described and shown in the drawings are cheaper; and it is the artistic effect rather than the price that justifies the use of siding, as their ability to withstand wind and weather

is about equal.

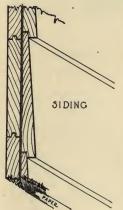
Redwood, white pine, cypress, and red cedar are well suited for clapboards, and the cost varies with the locality. Cypress, owing to its coarse grain, is better adapted for staining than for painting. Spruce is often used in New England, as a cheaper substitute for white pine of which so many of the old Colonial houses were built. Both siding and clapboards should have "rosin-sized" or waterproof paper between them and the rough wall boarding.

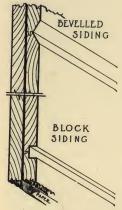
Shingles. — Shingles may be sawed or split. In the first case the general length is 18", with random widths,

3/8" thick at the butt or lower end, and 1/8" at the top. So-called "handmade" shingles are larger, heavier, have a smoother surface, cost a little more, and are more interesting and durable. Redwood and cypress are the longest lived, red or white cedar are next, while pine and spruce are the cheapest. The thicker the shingles the longer they last.

Shingles are nailed on the rough wall-boards after a layer of waterproof paper has been applied; a paper which can











Clapboards

These two details of narrow clapboards, one left to take on a warm soft color from the sun and rain, and the other painted white to match the trim, may be used to illustrate an early and a late period in Colonial design. The casement windows and overhanging second story of the older type and the front porch of the later, are in keeping with the finish of the walls. Henry A. Frost is the architect of the first house and Roger H. Bullard of the second

absorb water will rot them. They should be laid starting with two at the bottom, and then each successive course leaving exposed, or "to the weather," about one third the course beneath, and breaking joints so that the two shingles meet at least 2" from the meeting of the two below. The way shingles are nailed greatly affects their permanence. Nails should be of composition, real iron (not steel), or galvanized. Proper nailing will add five to ten years to the life of a shingled wall.

Shingles, especially the lighter and cheaper woods, should be stained for preservation and for appearance, and this is done by dipping all but a few inches of the smaller end in special stain with a creosote base and the necessary pigments, or else by applying it with a brush after the shingles are laid. The first method is preferable, as both sides and the edges are treated and no unstained parts can be exposed by shrinkage. Shingles may be bought already stained all one soft color, or in graded tones, and these are preferable to the harsh, solid colors sometimes seen on wall or roof.

Do not use ordinary lead-and-oil paint on shingles. A bleaching oil gives a natural weathered effect. Cypress shingles, owing to the quality of the wood, do not need the preservative or artificial coloring.

Shingles on roofs are discussed in Chapter IX.

Half-timber.—A "half-timbered" house is one in which the framework of the exterior walls is of wood of larger dimensions and wider spacing than the usual vertical studs and bracing. The framework is left exposed to view, and the spaces between are filled in with stucco or brick. This construction was common in the sixteenth and seventeenth cen-

turies in Europe, when it was adopted for the purpose of economy but it is used to-day for its picturesque quality.

The timbers should be heavily creosoted or stained as a protection against the weather, and in our climate great care must be taken that the junction with the plaster or masonry be made tight, to prevent open cracks due to the shrinkage of the different materials.

Imitation half-timber houses are sometimes designed, where thin planks are applied on the wall proper, but the roughhewn effect is lost and there is danger of the false timbers warping and opening up. Owing to the cost of large-sized lumber and hand-finishing, and the extra labor of properly fitting in the panels, it is not an economical method of construction to-day, and unless it is painstakingly designed and executed, it loses all architectural charm.

The log cabin.—Log walls are, of course, for the abode of the trapper and the frontiersman — also for the millionaire's electric-lighted camp in the game preserve. But the log cabin, aside from the romance of its origin and the quaintness of its appearance, has economical features worthy of consideration if there is a timber supply within practicable distance.

By sending to a logging camp simple blueprints showing the arrangement of the timbers, it is possible to have the trees cut, stripped, notched, and numbered ready for assembling. As the cost of material and labor in the native woods is relatively low and carload freight is possible, the cost of the material for a solid 10" wall is surprisingly low — as also for the erection, as it can be done quickly with unskilled labor.

The logs must be long, and with as little taper as possible, and the bark should be removed. Excelsior is the best

### THE WALLS



## Matched Boarding

For the pediment and the porch of this house tongued and grooved boards have been used which give a smooth surface, adding an element of refinement to the house and giving a pleasant contrast with the coarser textured walls of siding. Clark & Arms, Architects



#### Siding

In suburban architecture which aims to express the democratic life of this country, wide siding is an inexpensive and yet eminently satisfactory form of wall-covering. It does not "go out of style," as many more elaborate treatments do, and its good taste cannot be questioned. Russell S. Walcott, Architect





Half-Timber

These two examples of half-timber treatment show the rough solidity of woodwork needed to give the proper expression of the structural character. The timber-work here is a supporting member, not merely a covering from the weather. In one house the panels are faced with brick and in the other with stucco. H. T. Lindeberg is the architect of the first house, Morgan Colt, of the second house



Logs

This cabin was built of unhewn timbers, primarily for reasons of economy, the actual cost being less than the estimates for frame construction. But it fits into the pine woods and is comfortable for both summer and winter use

material for chinking between timbers, for, if pounded in with a wedge and mallet, it will make a tight joint, no matter how much the logs expand or contract. Such walls are far more enduring than frame construction and resist both heat and cold.

The interior can be left exposed with battens nailed over the joints, or sheathed with matched boarding or wallboard.

The design should be limited to one story in height, and the size of the rooms to the length of the logs available.



Stucco

The finish of this wall, which has much the appearance of a sand-float, gives a pleasant texture for the large wall spaces. J. D. Leland & Company, Architects

#### **STUCCO**

A variety in color and the chance for subtle gradation in the tone selected, a wide choice in texture and finish, a flexibility of treatment — all lend themselves in stucco to interesting and distinctive wall-effects. But just as readily as the medium responds to an artistic and skillful handling will it also betray any crudeness of design or execution, any slip in the choice of color, or blunder in the application of the materials.

If stucco is to be the wall best suited to the taste and purse of the home-builder, the first step is the careful consideration of the practical details which go to build up a firm base for the finishing coat.

Stucco is a surface treatment and may be applied directly on stone, concrete, hollow tile of baked clay, on brick, and on wood or metal lath. Of the last two, however, metal lath is



Stucco

For these buildings in a street in Santa Barbara, California, a smooth-textured stucco has been used, presenting an excellent surface for the play of shadows which form an important part of the picture. James Osborne Craig, Architect

much to be preferred. Metal lath may be applied to sheathing or used without sheathing and back-plastered. If sheathing is used, the boards should be laid horizontally, and there should be waterproof paper between the lath and the sheathing. The second method of back-plastering is much more satisfactory, as the likelihood of cracking is considerably reduced, and since the lath is thoroughly embedded in the plaster, there is greater protection against corrosion. With this second method satisfactory insulation can be obtained by the use of an insulating material fastened to the studs and



Stucco in the Garden

The rough, uneven finish of these garden walls gives them an appearance of age so successfully that one might easily believe the villa to be one in old Italy instead of in Gloucester, Massachusetts

so applied that a I" air-space is left between it and the stucco.

If the stucco is applied on masonry, there must be ample clinch, that is, roughness of the under wall, like uneven stone, coarse concrete, or bricks with the joints raked out. The wall with a masonry back is more weather-resisting and the least liable to crack, but it is more expensive. Masonry walls must be absolutely clean before the first coat is applied. All dust and dirt should be brushed off with a wire brush and the joints cleaned back to the face. A rough but clean surface gives the required mechanical bond.

Composition.— Stucco is made of the following ingredients: PORTLAND CEMENT. - This should be one of the approved

FINE AGGREGATE. — For this clean coarse sand, or "screenings" from crushed stone which will pass a No. 8 screen, may be used. The aggregate for the finish-coat should be thoroughly clean yellow sand.

HYDRATED LIME. - This, too, should be one of the approved makes.

HAIR OR FIBRE. - Preferably, first quality long hair, free from foreign matter should be used, or, second, long fibre well combed out.

COLORS. — These should be of mineral nature not affected by lime, cement, or the other ingredients, nor by the sun and weather.

WATER. - This should be clean and free from oil, acid,

strong alkali, or vegetable matter.

The mortar should be made up of not less than three cubic feet of fine aggregate to one sack of Portland cement. If hydrated lime is used, it should not be more than one fifth the volume of cement. If another form of integral waterproofing is used, the proportion of lime should be modified. Hair or fibre should be used in the first coat only when the stucco is used on wood lath or on metal lath applied over sheathing.

Mixing. — The importance of proper and thorough mixing cannot be too strongly emphasized, and machine-mixing is preferable to hand-mixing. The best form of machine is the rotary-drum type, which is usually run by a small gasoline engine. In this the period of mixing should not be less than five minutes after all the ingredients are introduced. On small-house work or where a machine is not readily available, hand-mixing is resorted to for reasons of economy. In this case a water-tight mortar-box should be built and the dry ingredients should be turned over until the mass is uniform in color; then the proper amount of water should be added and the mixing continued until the consistency is uniform.

All the materials should be measured by bulk, and for this purpose it may be assumed that a bag of cement weighing ninety-four pounds net is one cubic foot, and that forty pounds of hydrated lime are equivalent to one cubic foot. The water also should be carefully measured and not added by guess-work. As a general rule, the less water which is needed within working-limits, the better the quality of the mortar.

Mortar that has begun to stiffen, that is, take on its initial "set," should not be used.

Mortar Coats. — The best stucco is built up of three successive coats. The first or "scratch" coat is to form the bond with the wall or lathing, and form a support to the body of the stucco. It is usually about 1/4" thick or if back-plastered,

The second, or "brown" coat, is to form a true and even surface upon which to apply a decorative finish. In order to cover the inequalities, it is usually 3/8" to ½" thick. Occasionally the first and second coats are combined, either for reasons of economy or because the under surface (as with a brick or hollow-tile wall) is already smooth and plumb. If

only one coat is used in place of the scratch and brown coats, it should not be more than 1/2" in thickness, as a heavier layer is liable to sag and slip and produce an uneven surface.

The "finish" is for decorative and not structural purposes. It should be as thin as possible, consistent with covering capacity and the particular texture which is to be adopted,

and it varies from 1/4" to 3/8" in thickness.

The bond between the brown and the scratch coats needs to be strong in order to carry the weight of the body of the stucco; and for this reason it is preferable to apply the second coat the day after the first. If more than twenty-four hours elapse, or if the weather is very dry or windy, it is advisable to dampen the under coat. The interval before applying the finish coat should be as long as permissible, in order to enable the body of the stucco to obtain its initial shrinkage and a near approach to its final condition of strength and hardness. A week is a minimum time. The under coat should be dampened (but not saturated) with water when the finish coat is to be applied, although some types of surface texture, — as the "spatter-dash" finish, - which are wet mixtures, may preferably be applied to a fairly dry under-coat.

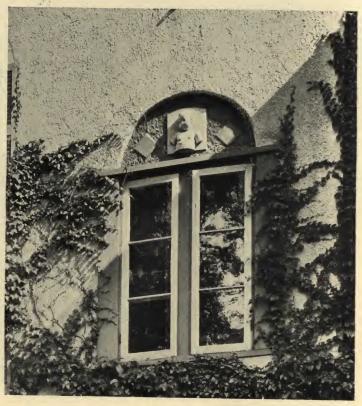
Stucco should not be applied in freezing weather, and even in temperatures slightly above, frost is likely to form on the

damp surfaces and seriously injure the material.

Stucco surfaces exposed to rain should be as nearly vertical as possible. Wood or metal laths should not come within twelve inches of grade, to avoid ground moisture. Let the

foundation walls come well up above the ground.

The metal lath may be of "expanded metal," weighing not less than 3 to 4 lbs. per yard and galvanized or painted after expansion; or of "wire cloth," No. 19 gauge, woven 2½ meshes to the inch, with reënforcing V-shaped members, galvanized or painted. The expanded-metal lathing should be applied horizontally over vertical furring, while the wire cloth should be applied vertically.

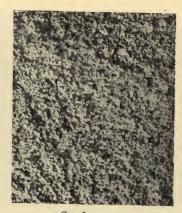


Stucco

Stucco walls in both houses and gardens can often be decorated by the judicious use of colored or modeled tiles, inserted when the stucco is being laid



Sand-float



Sand-sprayed



Sponge

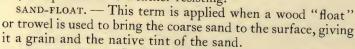


Spatter-dash

Texture. — After the body coats have been applied, the final coat must be carefully considered and large samples made upon the site well ahead of time; from these the finished surface and color under natural conditions can be studied. The chief textures are:

SMOOTH OR TROWELED. -This finish shows no aggregate and is used when a clear, natural white surface is desired. It is like interior plas-

ter, except that it is weather-resisting.



sand-sprayed. — In this finish a creamy mixture of cement and sand is thrown forcibly on to the finishing coat.

STIPPLED. — When the moist surface is raised into slight irregularities by a brush or a float.

sponge. — This finish is akin to stipple but is less even. spatter-dash. — When cement and fine aggregate are thrown on against the under coat.

PEBBLE-DASH. — When colored pebbles or "screenings" that is, fine crushed stone - are thrown on and pressed into the moist stucco.

EXPOSED AGGREGATE. — When the surface is brushed before absolutely hard, to remove the

fine particles of cement.

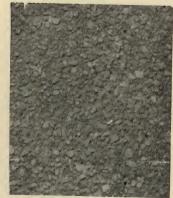
The methods increase slightly in cost in the order listed, but not enough to affect the selection, which should be based on the scale and character desired.

Real skill and craftsmanship are required to obtain the best results, and care must be taken that one section does not dry before the adjoining one is laid, or joints and divergence of treatment will be apparent.

The smooth surface is the only one adapted to painting, if this is desired; but it is better to rely on integral coloring, that is, powdered or liquid pigment mixed in the stucco before application. White cement gives added brilliance. With the sand-float fin-



Pebble-dash



Exposed aggregate

ish, the crispness of the texture and the quality of the color due to the slight contrast between the sand and cement will both be lost if painted over when first finished; but the special colors prepared for concrete and cement can be brushed on, if the walls become too dingy or stained.

Various chemical compounds have been developed for waterproofing stucco and the integral brands are best.

to strength and appearance; the

just use of water to prevent un-

even settlement of the aggregate

in the moulds or premature dry-

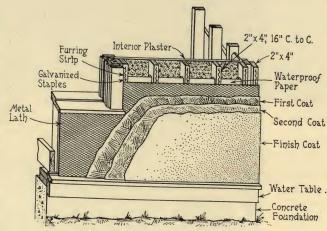
#### CONCRETE

Concrete is the sturdy, man-made substitute for stone. From the time of the Roman emperors it has been used, but only in this century has it been openly recognized and not hidden by veneers of marble, brick, or stucco.

There are two distinct methods of erecting concrete walls, the monolithic and the block. By far the oldest method and the one best suited for foundations in residences is that in which the concrete is poured into forms built in place, and allowed to harden into one homogeneous mass. The other method is to pour the concrete into a small portable mould, and when hardened, the block is used as a unit in building up the wall, course after course.

Monolithic Concrete. - The composition and pouring

of concrete were discussed in the preceding chapter. It is, in housebuilding, essentially a structural element. When employed above the foundations, it is usually covered with stucco, Waterproof Paper but occasionally it is left exposed. In many ways it is the -First Coat cheapest form of masonry, but Second Coat just because unskilled labor can -Finish Coat be employed in handling it, and because its decorative possibilities are little studied, great care and skill are required not only Water Table . in specifying and supervising but Concrete Foundation in the manual execution, if it is to remain exposed to view. The proper proportions in regard



Back-plastered Wall

This diagram shows the method of building when wire lath is used and is back plastered. The waterproof paper or other insulating material used should be kept one inch away from this back plastering





Laying of Concrete

These two illustrations show the construction of a house in Pinehurst, North Carolina, where sand and unskilled labor are readily available. The portable mould with collapsible sides builds one tier after another, leaving an open space the full height of the wall. The two sides are bonded together with short lengths of wire

ing and consequent disintegration; the smoothness of the forms with the avoidance of adhering paper or oil stains; the removal of the moulds and brushing or washing of the exposed surface at just the right moment after the initial set and before the final hardening — are details requiring judgment, experience, and constant inspection by the architect or his superintendent.

Typical treatments are various. One of the most attractive results may be had by using a clear, colored, broken stone as

"aggregate" (the body around which the sand and cement is mixed), and then stripping the forms or moulds and washing down the surface with a stiff brush before the final "set" or hardening has occurred. This removes the fine particles of cement and sand, exposing the clean bright surfaces of the aggregate. Another method, more expensive in labor but requiring less skill, is to "bush-hammer" or "Crandall" the surface after it is thoroughly dry. This means clipping the entire face with a small sledgehammer made of pyramidal points bolted together, which removes inequalities, scores the surface with fine vertical lines or evenly spaced points, and exposes enough of the aggregate to remove the dead gray of natural concrete.

The use of white cement adds to the beauty of exposed concrete but costs somewhat more. Pigments may be used with the cement, but the non-fading and reliable brands increase costs and are seldom essential.

When concrete is used in a collapsible mould which forms a homogeneous double wall, the mixture is much drier than when poured, and so the surface has many minor voids. As the wall is erected in successive layers, horizontal joints are left, which, with the rough texture, give a picturesque effect well adapted for farm buildings or bungalows.

Concrete Blocks. — The casting of uniform concrete blocks for building walls is sometimes done "on the job," but more

perfect results are obtained by buying at a plant which specializes in such products. There is a constantly increasing number of manufacturers of standard blocks who comply with the specifications of the American Concrete Institute and the newly introduced building-codes of certain communities; for now the use of concrete in this form has passed beyond the first crude steps. The fad for an imitation rough-stone face, with its monotonous repetition of the same "accidental variation," has passed; and now the plain concrete blocks are



Cement Blocks

Exposed cement blocks were not successful for house work when they were used to give an imitation rock-face. Here they have been whitewashed, so that a homogeneous and very pleasing wall-surface has been obtained. W. J. Frost, Architect



Walls of Concrete

In this house of concrete, built in California, the horizontal markings made by the successive layers of the material have been left. They stamp the house as one frankly built of concrete and give it a decidedly different and interesting appearance. Witmer & Watson, Architects



Cement Block

The use of cast blocks, combined here with brick, for smallhouse work is an inexpensive form of masonry construction. It is also an attractive one when the blocks have an "exposed aggregate" instead of an imitation rough-rock face. Sherrill Whiton, Architect

widely used as a base to be covered with stucco. Less often they are left exposed with an even face. In this case the surface is enlivened by the admixture of colored sand, marble chips, crushed slag, or mica spar to give life and quality, lacking in cement; and the treatment is similar to that described on the preceding pages in regard to exposed concrete.

Concrete blocks are cast either with vertical air-spaces to reduce the passage of heat and moisture through the wall, or in two separate sections, which are secured by wire ties put in place when cast or between the blocks when laid up. The voids should average at least a third of the volume. Their

usual size is 8" high, 8" thick, and 12" long. These are the most convenient dimensions for house work; but for foundations they are made 12" thick and heights of 6" or 12" are common.

For veneers and partitions, castings are made 6" and 4" thick.

Special moulds are designed for corner pieces, door- and window-jamb blocks, sills, and reënforced lintels. The latter are made in one piece where the interior of the wall is to be furred and lathed, but in two pieces with an air space between where the plaster is to be applied directly on the concrete. When the floor joists are supported on the outside wall, either special

blocks with notched ends may be used, or "veneer" blocks, used separately as a continuous exterior course and spaced between the joists on the interior.

#### BRICK

Almost the oldest writings are on tablets of burnt clay, and the most ancient civilizations down to those of to-day tell their autobiographies in brick. There are endless precedents to be found for wall treatments and yet ample novelties to be evolved and wrought

into their design. The house of brick is solid, handsome, weather-resisting, and, considering its low upkeep, comparatively inexpensive. The material and the masons for laying it are readily obtained in almost all parts of the country.

The use of brick in walls may be considered under the headings of construction, types of brick, bonding, and joints.

Construction. — There are four ways of using brick which, when laid up in a wall, have a similar appearance. Three of these result in real masonry walls. The fourth does not. These four methods are as follows: -

solid brick walls. - The thickness of a masonry wall is determined by its height and the load it must carry. In the case of a wall of solid brick, accepted practice has established the fact that for one- and two-family dwellings, where the walls are not over 30 feet in height, they may be 8" thick, provided they are properly bonded.

BRICK-FACED WALLS. - Sometimes brick is used as a facing against other materials, most commonly hollow tile. Such a wall has proved to be eminently satisfactory, and in some localities tile is laid up somewhat more cheaply than brick. When brick is so used, the minimum thickness of the wall, under the same conditions as noted for solid brick walls, is 12".

HOLLOW BRICK WALLS. — These are accepted as desirable for dwellings and up to 20 feet in height they need not be more than 8" thick. They have not been very extensively used in this country, owing to the fact that for average dwellings a thicker wall must be used for this type than for solid brick, entailing consequently more space and greater expense. Recent tests in Germany have shown that a 13" hollow wall can be more cheaply built there than a solid wall. They also proved that a 13" hollow wall has a lower heat-loss than a solid one, and that this loss is still further decreased if the spaces in the wall are filled with slag.

There are, however, three new types of hollow-wall construction which are proving to be practical, and which, as they require fewer bricks, are cheaper to build than the solid brick wall, although in some cases, where the contractor is not

familiar with the method, he may demand an unreasonable price simply because it is a novelty to him. These types are as follows:

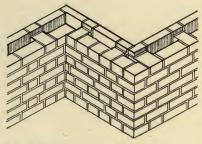
The Ideal All-Rolok Wall. In this type the brick is laid on edge, so that on the face of the wall the broad side of the brick appears, giving the wall a slightly different scale from the usual method.

The Ideal Rolok-Bak Wall. In this type the brick on the outer 4" course is laid as usual, while the backing brick is laid on

The Carver-Economy Wall. This is a newly invented method, which has not as yet been put to wide use. It consists of

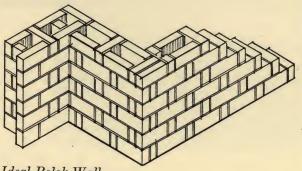
a 4" wall which is strengthened at intervals by pilasters and blanketed by back-mortaring.

VENEERED WALLS. - These have a masonry facing which is not attached and bonded to the backing in such a way as to become an integral part of it, and which does not therefore aid in its load-bearing strength. Brick is commonly used as a veneer against frame construction; when so applied it forms in no sense a masonry wall, but is used as an ornamental and fireproof coat, which costs more but



Ideal Rolok-Bak Wall

With front face laid as usual and backing bricks on edge. Showing Flemish, English Cross and Common bonding



Ideal Rolok Wall

With both face and backing bricks laid on edge. Here the Flemish bond is shown

requires less upkeep than one of clapboards or shingles. Although such a wall has the appearance of brick, it has not all of its advantages.

In setting brick or hollow-tile walls it is important that all of the surfaces in contact be cemented, and not merely the edges. The horizontal joints should have the brick shoved into the bed mortar and the vertical joints should be slushed full.

The composition of the mortar varies according to the needs of different parts of the masonry. Care should be taken that the cement is of an approved brand, either selected by name or according to a recognized standard described in the specifications, and that it is kept dry before mixing; that the lime putty stands in the bins at least a week after it is slaked, or stirred with water; and that the sand is coarse, sharp, and free from salt or loam. Only enough mortar for the day's use should be mixed at one time, as it deteriorates if allowed to stand over twenty-four hours.

Types of Brick.—The majority of brick are made of clay which has been moulded and burned, but their chemical composition, their mixing and cutting and moulding, and the amount of heat used in burning, all affect the strength and appearance of the finished product.

All brick, after they have been moulded, must be dried and then subjected to the action of fire in kilns. A brick may be darkened by overburning; if underburned, it is

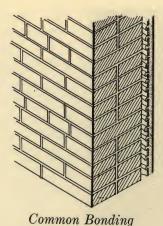
known as salmon brick because of its light color. A well-made brick will not absorb more than from 10–15% of its weight, and should possess a crushing strength of 2000 lbs. per sq. in. All brick, both common and face, are now made according to a recently adopted standard of 8" long, 2 1/4" thick, and 3 3/4" wide. The quality of brick must be considered from many standpoints, but it should be kept in mind that the requirements for front brick are necessarily more severe than for the cheaper kinds used for backing-up in a wall.

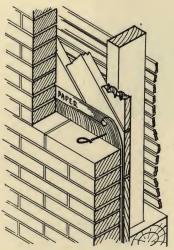
There are three principal types of brick, distinguished according to the method of making them. They are as follows:—

soft clay process. — This term is applied because the clay used contains a large percentage of water. The method consists of pressing the soft clay either by hand or by machine into wooden moulds. Brick so made are porous and cannot be made dense even by hard burning. This does not mean, however, that they are not durable, as structures of brick so made in mediæval times have shown remarkable resistance to weather. Brick made by this method are called water-struck or slop mould, terms applied when the mould has been flushed with water, or sand struck or sand-mould, terms used when it has been sprinkled with sand.

WIRE-CUT PROCESS. — This consists in forcing the clay through a die while it is in the form of a stiff mud ribbon having the cross section of a brick. By means of wires stretched across a frame this thick ribbon is cut into brick. This process is especially used in the case of face brick, as it results in a characteristic texture.

DRY-PRESS PROCESS. — This process reduces the raw material to a moist powder and shapes it into the desired form by means of powerful presses. The result is a perfectly shaped and uniform brick, compact and dense, but one that is too





Brick Veneer

mechanically perfect to make a wall of pleasing color and texture.

Special practical needs have developed special types, of which a few examples are noted below. They cost more than the average grades:—

FIRE BRICK. — These are made from a flint clay with high resistance to heat and will not fuse at the exceptional temperatures found in boiler- and flue-linings.

PAVING BRICK. — These are particularly

PAVING BRICK. — These are particularly dense and hard-burned, stronger than the usual forms which do not have to resist jars and abrasion.

The form of brick for a special use also often has a special name.

BULL-NOSE BRICK. — These have a rounded edge and are used at the jambs or corners of doorways and the like to avoid chipping. They are made with one face curved for use in columns or chimneys.

voussoir brick. — These are thicker at one end than at the other so that they will form arches.

Some brick derive their color and texture from an applied composition which is baked on, to form a translucent or opaque glaze. They are akin to the conventional tile, yet are designed to be used in walls where structural strength is required — not merely decoration. Among them are:—

SALT-GLAZED. — These are the least expensive brick which have a vitrified surface, making them washable and nonabsorbent. Their color ranges in shades from light yellow

to dark brown, and they are well adapted for the interior walls of basement halls, garages, swimming-pools and the like.

ENAMELED BRICK. — These have a heavy glaze in white, black, and many colors, but are much more expensive than the salt-glazed. They may be used in place of wall tiles where greater strength is required.

Brick not made of clay that are coming into increased

popularity are: -

SAND-LIME BRICK. — These are a mixture of sand, bound together by a hydrated calcium-silicate. In localities where clay of a quality required to make good brick cannot be obtained, and where common brick cannot be transported economically, sand-lime brick provide a cheap, durable, noncombustible building-material. They are seldom used as face brick.

Bonding. — Bonding in brick work is the overlapping of the brick one upon the other, either along the length of the wall or through its thickness, in order to tie them together in a secure, structural mass. With a brick veneer on wood there is no bonding in the strict meaning of the word, but unity is effected by means of metal ties, nailed on the boarding as the brickwork progresses and so spaced that they can be built in between the courses and held in the cement joint, or else held by nails which are driven into the studs with their heads left projecting. When brick are applied on hollow tile, either wire ties or cross-bonding can be used.

The bonding of the brick, as seen in a finished wall, forms a definite pattern varying with the type used. These patterns have been developed to add beauty to the surface, in addition to their utilitarian purpose. They are formed by various combinations of "headers" and "stretchers." When a brick is laid lengthwise, showing its long narrow dimension, it is called a stretcher. When its length extends back into the wall show-



Flemish Bond

Although the photograph is perhaps too small to show the bonding used, it does show the pleasant texture given by the Flemish bond and the variety of color obtained by the use of many dark hard-burned bricks. Dwight James Baum, Architect

String Course

A pleasant variety is given this house by the use of a string course of projecting brick just above the first-story windows. This gives a slight shadow line to the surface of the wall. Aymar Embury II, Architect

ing its short dimension, it is called a header. The different bonds in common use are as follows:—

RUNNING BOND. — This is the most common, the least expensive — and the least interesting; it is for service, not style. It is composed of stretchers laid with the vertical joints coming over the middle of the brick below. A modification of this is the *American bond*, in which every fifth or sixth course is tied in or bonded with the backing-up wall with a full course of headers.

rlemish bond. — This has each course alternate headers and stretchers, the course above having its headers over the stretchers in the course below. Often the headers are of a darker shade, — especially if the so-called "Harvard waterstruck" brick is used, — thus bringing out the pattern; but care should be taken not to have all the headers uniformly dark, as this gives an unpleasant checkerboard effect.

ENGLISH BOND. — This is made up of alternate courses: all of headers and then all of stretchers. In both this and the Flemish bond it is customary to "clip" or use only one half of the header brick, except in the through-bonding course, to economize in the face brick and make the adjustment of the courses easier if the face and backing brick are not the same size.

DUTCH OR ENGLISH CROSS BOND. — This is similar to the English, but with the vertical joints in the stretcher-courses alternating, instead of lining up with the ones in the stretcher-courses above and below. If the variation in the color of the brick and the width of the joints is adjusted, the diagonal lines are emphasized in a diaper pattern.

Any one of these three special bonds gives life and variation



Pattern Brick Work

A diaper pattern is traced on this wall by the placing of the headers, a pattern, however, that is not too insistent but is allowed to die away here and there in the brickwork. John Russell Pope, Architect



Brick Door Enframement

The excellent brickwork of this house is seen not only in the texture and color obtained by the character of the brick selected and the type of joint used, but also in the slight projection of the brick to give strength to the doorway. Andrew J. Thomas, Architect



Raked Joints

The pattern of the bond and the course of brick, lining with the window sills, is emphasized by the raked joints which give a play of light and shade and a marked contrast to the fineness of the doorway. Dwight James Baum, Architect

to the blank wall-spaces and decorative patterns to the piers or spaces between the windows. They are well worth the slight increase in cost, unless the most rigid economy is demanded.

There are other less common arrangements which are usually interspersed to vary the effect. An all-header or checkerboard wall where only the ends of the brick show, is built to fill a panel or the spandrel of an arch, and the herringbone design is frequently used in small areas.

Joints. — The jointing between the face brick has a pronounced effect and should be considered in relation to the size, color, and pattern of the units and the bond to be used. The selection depends on artistic feeling rather than on practical needs. In determining the joints, the following considerations should be taken into account: —

WIDTH. — With special enamel brick this should be as small as possible: in ordinary exterior work 1/8" to 3/8" is usual. With Roman or with rough-texture brick an even wider joint is used; but this increases the difficulty and so the cost of laying, unless pebbles are mixed with the mortar.

narrow joint should be of fine sand, cement, and lime. For the wide joint, 3/8" or more, it should have fine pebbles or grit, coarse sand, Portland cement, and a small amount of lime-putty. The addition of the coarser materials will give a surface that is rougher and an easier setting.

COLOR. — If a white joint is desired, use one of the standard brands of white cement and a white sand. For ordinary work any coarse, sharp sand except from salt water beaches is satisfactory, and if highly colored, so much the better. When coloring matter is used to produce a special effect, the pigments should be those prepared for this purpose by manufacturers of well-established reputations.

reason of their shadows or colors, emphasize or blend the patterns and colors of the brick. These effects cannot be fully appreciated even from the illustrations shown in this chapter, but must be seen in examples of finished walls. Typical joints are as follows:—

Flush. Where the surface is cut off level with the face of the brickwork.

Struck. Where the surface starts flush with the top brick, and is beveled to a point slightly back of the top edge of the lower brick.

Weathered. The reverse of the above, where the bottom is flush with the lower brick, and the top slightly back of the bottom edge of the upper brick.

Tooled. Where the joint is ruled with either a rounded or V-shaped tool or "jointer."

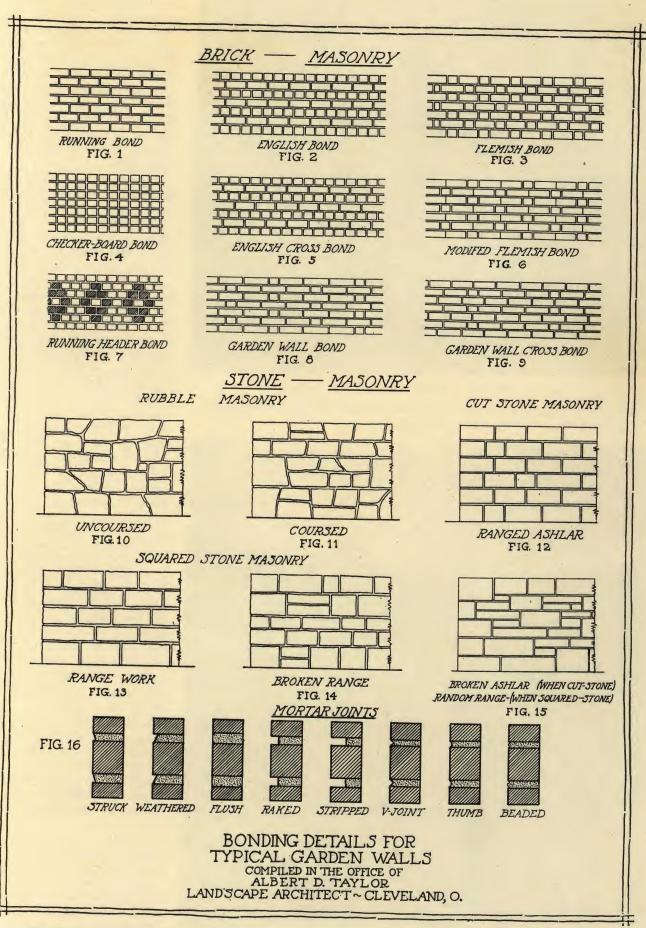
Rodded. Where the top and bottom

of the joint are ruled with the trowel against a straight edge. *Raked*. Where all the mortar is removed to a depth of about 1/4".

#### STONE

There is no more aristocratic or more picturesque building material than stone, when it is skillfully used. It is permanent, cool in summer and warm in winter; but it is costly unless the material is near at hand and easily adjusted to the width of the wall. The character of the stone itself often prescribes the form and finish in which it is to be incorporated, and so determines to a large extent the entire style of architecture. Limestone, granite, sandstone, marble, and bluestone are the most important in housebuilding and — except for imported marbles — are the products of our native quarries and deposits. In certain localities or under certain conditions, exotic or localized stones may be considered, such as the coquina of Florida, or the lava blocks of the Southwest.

The new house should suit both the surroundings and the owner. If it is a farmhouse in a countryside where there are outcroppings of ledge, the native stone should be utilized with a haphazard surface, so that the home will seem to have



The above chart shows different brick bonding, various types of mortar joints, and different types of stonework. Although prepared for garden details, it is applicable to all masonry walls



Random Rubble

In these walls of Philadelphia ledge stone the joints are made large so that a uniform texture is given to the building. Willing & Sims, Architects



Ashlar

The smooth, uniform blocks of limestone, and almost invisible joints of this Renaissance villa offer a surface as uniform as stucco. Walker & Gillette, Architects

grown out of the land itself. If it is a suburban house in a neighborhood of well-kept lawns and terraces, then walls or trimmings of smooth warm limestone give an air of refinement and elegance which can be excelled by no other material.

A wall of stone may be considered from the point of view of the construction or laying of the individual blocks, the finish or character of the exposed surface, and the variety of stone used.

Construction. — There are two general types of walls, rubble and ashlar.

RUBBLE WALLS. - In these the stone is left rough - either field stone with more or less rounded sides, as picked up in the neighborhood, or quarried stone in which the blocks have flatter sides and so afford better bonding and bedding. The crudest and least expensive form of rubble work is called random coursed, in which there is practically no parallel jointing. It is most commonly employed in foundations. The blocks are laid up in mortar, but beyond that it differs little from a pasture wall, except that the latter is "dry," that is, without mortar. A house built of cobblestones is the reductio ad absurdum in looks, in the use of field stone. A less crude form is regular coursed stonework in which the beds or horizontal joints are parallel but with varying heights, and vertical joints not necessarily true.

ASHLAR. — This type of stone-work has the outside facing of cut stone, regardless of its finish. There are two main variations: in random ashlar all the blocks are rectangular, but the horizontal joints are not continuous; in regular or ranged ashlar each course is the same height throughout, and the horizontal joints are continuous.

Finish. — When stones are cut there are several ways of finishing the face, to which the following terms apply:—

MOCK FACE. — This has the surface much as it comes from the quarry, but with edges chipped down to a line.

crandalled. — This, on the softer stones, has the surface tooled into fine parallel lines or crisscrossed.

BUSH-HAMMERED. — In this finish the stone is dressed to a fairly even surface and then finished in parallel lines with a hammer whose face is made up of separate blades.

VERMICULATED. — This word, meaning worm-eaten, is given to the

finish with short twisting grooves gouged in the surface of the stone. It is expensive, and is used abroad more than in this country.

RUBBED. — By this finish the face is brought to a smooth surface.

POLISHED. — The rubbing is here carried to an extreme degree, as with marble or granite.

Varieties of Stone. — In each locality the availability of native stone, the expense of transportation, or the local character of design will influence selection; but a few suggestions are here given on the use of the more common varieties of building stone.

GRANITE. — Granite is an igneous rock, that is, one produced by the action of heat. It is the hardest and the most durable building stone, but not the strongest. It varies in texture from very fine to very coarse, and in color ranges from white, through the grays to green, pink, and red. Seam-faced granite is quarried in sheets and is used undressed, with its natural face — commonly goldenbrown in color — exposed. Granite is a common building stone but is little used in domestic work except for the base course on city buildings, doorsteps, and window sills.

LIMESTONE. — Limestone is an aqueous rock, that is, one produced by the action of water, the product in most cases of large shell-deposits. It varies in texture from a fine to a coarse grade and is most commonly found in buff and gray shades. It is a softer stone than granite and is consequently more easily worked. It is cut from the ground in large slabs, which are then sawed into smaller blocks. Limestone is used principally for public buildings and for large residences, although it is not entirely confined to them. It is used extensively as a facing stone, which is often referred to as the "ashlar." When so used, it must be well bonded or tied-in with its backing, and should have its horizontal courses alternately 4" and 8" in thickness. Projecting members, such as cornices or belt-courses, should be thicker; in fact, the mass of the stone within the wall should be greater than that which projects, so as to maintain a natural balance, not depending on anchoring with metal ties to the adjoining masonrybacking. Limestone is particularly adapted to the Georgian and Renaissance styles, as it can be readily cut into delicate details and mouldings, while its soft, light tone and even quality make pleasing, flat wall-surfaces.



Painted Rubble

The coursing is rough and haphazard but the coat of white has unified the effect. The breadth of wall between the windows is another element of character. Carl A. Ziegler, Architect



Stone Carving

The columns and arches required careful cutting, but the wall blocks were chipped into shape. The casement windows and bay covered with sheet metal are of unusual interest. Alfred Hopkins, Architect

Two varieties of limestone which are imported from abroad are travertine and bath stone. Travertine, which comes from Italy, is a buff-colored stone with a pitted surface. In that country it has been used widely for exteriors, but here, so far, only for interiors. Bath stone, a cream-buff stone imported from England and largely used in that country, is used here somewhat for interior work.

SANDSTONE. — The old "brownstone fronts" of fifty years ago were immensely popular in their time; but they have given sandstone a rather bad name, because the material failed to resist frost and because it had such a dull rusty color. In northern states, when the natural strata were laid vertically the carving and the exposed surface often flaked off, but when laid horizontally the rapid disintegration did not occur. Many quarries have since been opened up where the stone is harder, more weather-resisting, and more attractive in color. The material, in both treatment and texture, is not unlike

BLUESTONE. — This is a fossilized clay and varies considerably in hardness and formation. The most common formation in residential use is the ledgestone of Pennsylvania, where slabs are easily quarried in convenient sizes for masonry walls. The hardest deposits are particularly well adapted for flagstones and street crossings. For the latter, municipalities require a dark-blue, even color, and the slabs which have been discarded because of warmer or lighter shades are bargains just suited for the floors of private hallways and terraces.

MARBLE. — There are many native quarries of marble, supplying different colors at a considerable range of price. For the residence of moderate cost this stone should be employed only for keystones, window sills, and the like on the exterior, and for fireplace facings, floor tiles, and similar minor

details on the interior. Some of the purples are liable to fade after exposure to direct sunlight. The whites and pale yellows are the strongest and least likely to have seam-cracks.

#### OTHER MATERIALS

Experiments are continually being made to find new building materials for domestic purposes, either for the sake of economy, for the utilization of local supplies, or — as is the case at the present time in England — for the purpose of finding a material which will not involve the employment of bricklayers and plasterers, of whom there is at present a great shortage in that country. Several new forms of accepted materials are on the market, but few of them have been sufficiently tested as yet to be recommended.

Adobe. - In the Southwest, where adobe had been used for generations as a building material, it is now being revived and used again in certain types of houses. Adobe bricks are sun-baked, made of clay bound together with straw, exactly as they were made in Egypt in early times. In modern practice the bricks are laid in mortar on a cement foundation and mud-plastered, or covered with metal lath and then stuccoed.

Pisé de Terre. — Earth has been used for building purposes for centuries and pisé de terre, or rammed earth, is not a new product, although its introduction into the United States is recent. The method is suitable for small cottages, and rightly followed, results in a house that is damp-proof and also it is claimed - cold- and heat-proof to a marked degree. In its construction a foundation wall is built as usual, on which are laid up, in moulds especially constructed for the purpose, walls of earth rammed to the necessary density. The character of the soil used is an important element.



The stonework of this house, with wide joints and definitely marked horizontal lines, is typical of the work of Pennsylvania architects and carries on local tradition. Mellor, Meigs & Howe, Architects

# THE WALLS



Broken Range

In this type of stonework, the courses are not continuous, but each stone has a rectangular face. Because of the square edges the width of the joint can be reduced. Lewis Bowman, Architect



Stone and Wood

This use of stone and wood in Pennsylvania is typical of the region. R. Brognard Okie, Architect



English Limestone

Although this house is in the Cotswold district in England, the character of the stonework (broken range) and the texture of its finish offer many suggestions to American builders



Adobe

In the West the use of adobe, an old building-material, is becoming extensive. John Byers, Architect



Stone and Brick

Brick has here been skillfully combined with stone to give variety and color to the walls and definition to the door and window openings. Mellor, Meigs & Howe, Architects

### THE ROOF

woodwork to decay.

upkeep.

'HE individuality of a house and its conventional architectural style are as clearly defined by the roof as by the walls.

Consider the romance of Grecian pediments and Persian domes, cathedral leads and peasant thatch, Tudor slates and Spanish tiles, and the "House of the Seven Gables.'

The contractor probably does not care greatly for the poetry, but he is familiar with the usual forms and materials, and he has his own terminology.



The form of the roof is determined perhaps by climate more than by any other single factor. In southern countries, where there is no snow and where the roof-top is used often for living-purposes, the flat roof is common, while in northern countries, where snow is an element to be reckoned with, the steep roof is a natural development.

The flat roof. — This type of roof, besides being used in hot climates, has been adopted for the modern factory, where it is the cheapest, and for the city house, where snow must

> the flat roof, despite its name, should have a slope of from  $\frac{1}{4}$ " to  $\frac{1}{2}$ " per foot, to prevent rain water from standing. Tar and

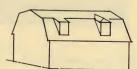
> simple form, has two sides which run up to a ridge and leave gable ends, affording attic space and windows without recourse to dormers.

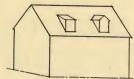
> The hip roof. — This is one in which all four sides slope up to the ridge or peak, and must have been what Shakespeare had in mind when he referred to "a penthouse lid." Dormers or skylights are needed for light.

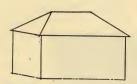
> able desire to enlarge the attic headroom, by bending out the slopes of a gable roof, has resulted in the type known as the gambrel roof. A perversion of this, applied to the hip roof, produced the mansard, fortunately no longer in public favor.

### Roof Angles

The slope of the rafters is either given by inches, as 8" in 12", or by degrees, as 30°. The top and bottom slopes show the practicable minimum for shingles and the conventional maximum

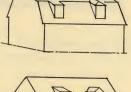


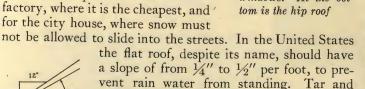


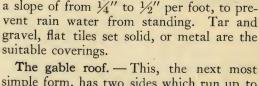


Roofs

At the top is the gambrel roof, below is the gable roof, each with two types of dormer windows. At the bottom is the hip roof









In country and suburban houses the form of the roof is

determined largely by the style of architecture, but this, of

course, should be in harmony with the climate. The cost is

more dependent on the materials of the roof than on its form.

the roof makes with the horizontal or by the ratio of height

to span. A pitch of 26° 33' or "one-in-four" is the safe mini-

mum for slate, and 30° (that is, a little steeper) for wood

shingles. The greater the pitch the less chance there is of

rain leaking in, or dampness remaining which will cause

**MATERIALS** 

selected for the roof. In making the choice, location and the

style of the architecture of the house are the prime considera-

tions. Expense also must be considered; but with regard to

this item it should be remembered that it is not the first cost

which is important, but this cost weighed in the light of the

durability of the material and the probable expense of its

Wood shingles. — The wood shingle has long been a

common roofing-material, and its popularity is based on

certain well-recognized merits. It has a definite artistic value

and for many types of houses, from this point of view of

appearance, cannot be excelled. It is light in weight, can be

It is doubtful whether among all the materials for building purposes there is as wide a variety as among those to be

The pitch or slope of the roof is defined either by the angle

On this gambrel roof house of Dutch type wood shingles seem the inevitable roofing. Charles C. May, Architect

The gambrel roof. — A frank and reason-









Types of Roofing

The roofing materials above in the order shown beginning at the left are: slate, asbestos slate, graduated slate or Tudor stone, and shingle tile. Courtesy of Architects Samples Corporation

easily applied, has excellent insulating value, and — when a high grade is used — has durability. Shingles of cedar, cypress, and redwood give the most satisfactory results, although in some instances pine shingles have shown good lasting-qualities.

Shingles are made in 16", 18", and 24" lengths, and may be

laid with various exposures to the weather. A 16" shingle, on a roof having a one-half pitch or greater, should be laid  $4\frac{1}{2}$ " to the weather; larger ones may have a larger exposure. Sometimes shingles are laid with a very narrow exposure, to give the effect of a thatched roof. This method, however, must be used with great discrimination and can produce pleasing effects only when supervised by an artist. Shingles for the roof are laid directly on the rough boarding, without the building paper needed when they are employed for walls. Ordinary wire nails should not be specified, as their life is much shorter than that of the shingles. Hot-dipped, zinccoated, cut-iron nails are best, although plain cut-iron or galvanized-wire nails will also prove satisfactory.

The chief objection to the use of wood shingles as a roofing material, especially in congested districts, is the fire hazard they present. Although the manufacturers put forth figures to prove that only a small percentage of fires in the United States originate in roofs, the wood shingle for this purpose has been prohibited in many cities and large towns. It is true that, as sparks and embers are more likely to roll or blow off a smooth surface than a rough one, keeping the roof in good condition by staining or creosoting improves its fire-resistance.

A further discussion of shingles may be found on page 53 in the chapter on Walls.

Prepared shingles.—There are various types of fabricated and processed shingles on the market to-day, made of different materials.

ASPHALT. — Asphalt shingles are made of felt, saturated with asphalt and surfaced with

crushed slate or coarse sand, which renders them fire-resistant. They come in various colors—greens, reds, slate-colors, and more recently, in black. The durability of this type of roofing depends upon the grade used; the lighter ones have a tendency to curl up and — if not correctly laid — to bulge in the hot

sun. The heavier ones, however, will form a satisfactory inexpensive roof. Asphalt shingles should not be used on a roof that slopes less than 3" to the foot horizontally.

The same material comes in rolls, varying in thickness from a light felt to a sheet of several ply, too heavy to be rolled. This type is less satisfactory for dwellings, as it will

stretch or wrinkle and after a time develop weak spots. Also with this type, except for a narrow lap, the roof is covered with only one thickness of the material, a very undesirable feature.

ASBESTOS. — Asbestos shingles are composed of asbestos rock-fibre and Portland cement, compressed under great pressure. They have been put on the market to meet the fire laws, and to compete with slate and tile in price or looks.

The early product of a decade ago—in rather large and thin squares—became brittle with age and was unattractive in both color and design. Much heavier shingles are now made, with rougher edges, pleasant tones, and more artistic textures.

Slate. — Slate is a natural rock which, because it can readily be split into thin sheets, has long been used as a roof-covering. It is permanent and fire-proof and although expensive in the first cost, is not prohibitive for the small house, as its maintenance cost is negligible. Slate comes in black, blue-black, gray, blue-gray, purple, mottled purple-and-green, green, and red. Some of these colors are fast, others will fade. The former are referred to as "unfading," the latter as "weathering." The charm of a slate roof depends as much upon a pleasing blending of colors as upon a varying texture. At one time a uniform roof was considered an effect to be desired; to-day a certain freedom and informality in the laying of the slates and a variation in their width is thought to produce a roof of greater character. For special purposes slate can be selected at the quarry both for color and for size. For ordinary service

slates are split to  $^3/_{16}$ " and range in size from 6 x 6 to 12 x 8 inches. Heavy slates require a special framing for their support, but this is not true of the standard size.

Tiles. — Tiles are usually of terra cotta, that is, burnt clay. They come in an unglazed red or glazed in many colors; the



Types of Roofing

Above is shown an asbestos shingle and below the super giant composition shingle. Courtesy of Architects Samples Corporation and the Richardson Company



latter are more expensive, but more permanent in a climate with extremes of temperature.

The common trade name of "Mission" applies to the primitive form, semicircular in section, like those on peasant houses of warm climates; but this does not have an interlocking device that is needed in most parts of the United States to prevent leaks.

The so-called Spanish tile is S-shaped, and, as can be seen by the illustration, has much the same appearance as the simpler mission type; but in this country it is usually made in such form that the units fit closely together.

The French model has a wavy surface and the method of interlocking is highly developed, coming from use in a wetter northern climate.

The "shingle tile," as the name suggests, shows a flat surface, but two of the concealed edges are turned up, to fit snugly in grooves on the adjoining and superimposed units.

In the Roman type flat and arched tiles alternate, and in the Greek, flat and bevel-topped.

Specially moulded forms are required for ridges and hips, and for their points of intersection, called finials.

It is no longer the fashion to have each tile on the roof a machine-made exact replica in form and color of every other. Instead, there is a realization that the individuality of handwork and a weather-stained charm can be obtained by specifying variegated colors and even accepting (at a considerable reduction in cost) the grade of "seconds," that is, tiles which are slightly warped or a trifle under- or over-fired, or with vagaries in the quality of the glaze.

Tiles have also been made of cement in recent years; but have not yet been widely introduced.

Metal roofs. — These may range in quality from the galvanized iron of the freight-yard shed to the solid bronze of the City of Mexico Opera House; but the average American home-builder is likely to be interested only in tin, copper, and

zinc. The first, if on a flat roof, especially where it may be walked on at times, should have a *flat seam*, that is, the interlocked joint of two sheets should be folded down over the nails which hold the metal to the roof boarding, and then soldered water-tight. With copper the soldering is not necessary and is not recommended. If it is on a sloping roof, the appearance is enhanced by a *standing seam*. In this case the sheets of tin are double-seamed and soldered together into strips reaching from the eaves to the ridge; then the sides or sloping edges of these strips are turned up, held in place by cleats, and interlocked. For permanence it is well to paint the under side of the metal before it is laid, as well as the top after installation.

With sheet copper the procedure is about the same as with tin, but the life of the roof is longer and the cost greater. Instead of paint, an oil finish may be given, but with exposure pure copper will assume the well-known light green patina. Interlocking shingles of copper have lately been fabricated, and may be used where an original effect is desired. They may be laid on new roofs or over old shingles.

Sheet zinc is also used, but more on public buildings than on residences.

Tar-and-gravel. — Roofing of this material is built up of three to five layers of tar paper, according to the quality which can be afforded; each layer is mopped with hot pitch and the top is mopped and then coated with screened fragments of slag or small stones which are imbedded in the pitch. This roofing is effective, but can be used only on flat surfaces. A bond guaranteeing the work for ten or more years is often required, but this should be called for before the contract is let, not after. The materials will run in hot weather except when practically level.

Canvas. — This material is used on sleeping-porches, as something not too costly, yet waterproof and strong enough for the normal use. It should be of the best-quality duck, first moistened, then heavily painted, then stretched, and the



Spanish Tiles

On this charming old adobe house in California tiles are the appropriate roofing material. Carleton M. Winslow, Architect



Shingle Tiles

Shingle tiles, dull red in tone, are here shown appropriately used on a stone house. There is an "open" valley here lined with metal which is carried under the tiles

edges folded and secured every inch or so with long copper tacks set in white lead. It should be flashed with metal against walls and around or under posts, as is done on a tin roof.

Plastic roofing. — There are various patented compositions for use on flat roofs and sleeping-porches, which can be spread on in plastic form. They require a firm foundation.

### WEIGHT OF MATERIALS

The weight of the roofing-material affects the strength required in framing and rafters. In building a new house,

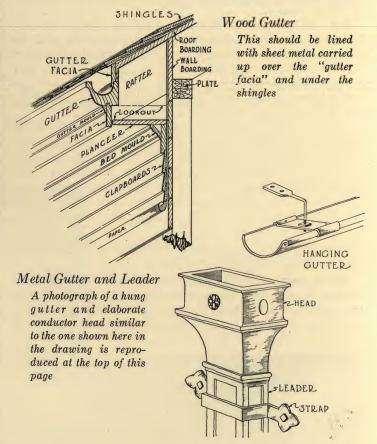


Metal Roof

Here the sheet metal is laid over square battens which not only allows for expansion but adds character to the roof. Dwight James Baum, Architect

the difference in the amount of lumber required to support a tile or slate roof as compared to a metal roof is a small percentage in the total cost of the house or even of the roof, considering the framing, boarding, and covering, so that it should not be one of the chief considerations in selecting the type of roofing. Appearance and durability are far more important. On the other hand, in altering a house where the roof has been designed for a very light covering, the cost of reënforcing the framework to support much heavier materials might involve a considerable expense.

The following table, prepared by the manufacturers of copper shingles, affords an interesting basis for comparison



of the relative weights of seven types of roofing as compared with two types of copper roofing.

Material	Weight per	
	100 sq. ft. laid	
Shingle tile	1200-1800	pounds
Spanish tile	650- 850	* "
Slate	450- 675	"
Felt and gravel (or slag)	400- 625	"
Asbestos shingles	300- 650	"
Hard-lead sheets	210- 325	- "
Wood shingles	200- 300	"
20 g. Galv. iron (corrugated)	- 225	"
16 oz. Copper (standing-seam)	- 125	"
Copper shingles	84- 100	"
Tin	- 75	**
	- 13	2

### GUTTERS AND CONDUCTORS

The rain water from the roof is collected in the wood or metal gutter at the eaves and then carried down through metal conductors, down spouts or rain-water leaders, as they are called in different parts of the country.

The hung gutter. — This type consists of a semicircular trough supported every few feet by metal strips on the under side of the projecting eaves. It is the simplest form.

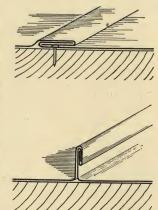
The built-in gutter. — Where a cornice is built out beyond the projection of the eaves, the built-in gutter is used and is often incorporated in the top member (see diagram). In this case the entire cornice and gutter may be made of sheet metal, or the ornamental parts made of wood and the gutter itself lined with metal, which should be carried up under the slates or shingles as "flashing," to prevent the water from working up and in. If there is a masonry cornice, it is cus-

tomary to have the gutter behind the parapet wall above the cornice; the conductors are brought down through the roof and back of the cornice, then out through the wall to a conductor "head" or box. This last feature lends itself well to decorative treatment and is often introduced as a junction box below the "goose-neck" or curving pipe dropping from the gutter in the cornice and bending in toward the wall.

The conductor. — This follows down the wall and is securely stapled to it. It may turn out at the bottom and discharge on a stone or concrete slab set flush with the ground to prevent erosion, or it may be connected to a cast-iron standpipe or con-

ductor-footing which goes underground to a dry well or to the surface-water sewer. In most communities it is not allowed to discharge rain water into the main sewer.

Conductors may be of galvanized iron, copper, or zinc. If of galvanized iron they should be heavily painted. Copper and zinc are more durable and are well worth the additional cost. Zinc may be oiled or stained, but copper only if an immediate color effect is desired. For strength and



Metal Seams

Above are a flat seam and a standing seam as used on metal roofs

CAP FLASHING SLATE ROOF

Flashing

Here the sheet copper starts under the composition roofing and is brought up the parapet wall. At the top it is overlapped by the counterflashing. The sheet in this case is carried through the wall as through-flashing to prevent moisture seeping down through the brickwork

cheapness combined, the round corrugated form is the best, but for appearance the square or rectangular sections in stock designs are far more attractive; these are made plain or paneled.

Simple conductor-heads or leader-boxes are carried in stock, but special designs with monograms or dates are not expensive and add a distinctive touch.

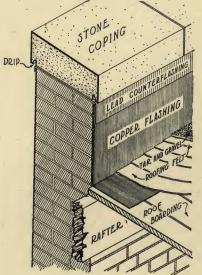
#### **FLASHING**

The sheet-metal work of flashing, as well as of gutters and conductors, embraces a score or more of details, each of which is important. Rain water has a most perverse desire and ability to make its way inside the house, and every junction of different materials or different surfaces must be protected. The unequal expansion under heat of stucco and wood, of brick and slate, of tar and tin, must be safeguarded against, as well as the climbing ability of water under capillary attraction, which allows it to find its way up under shingles and gutters, causing considerable damage unless prevented.

Each exposed projection from the wall, even if only of a window top, must be protected from seeping water. Tar paper built in over the window frame and carried up against the studs is not a satisfactory substitute for metal flashing. Where a cornice over the entrance or a porch "deck" joins the wall, offering a larger surface to the rain, metal flashing must be carried up under the clapboards, shingles, or stucco, or if the wall is brick or stone, must be turned up against the ma-

sonry and then counterflashed, that is, have a separate sheet of metal built into the joints above during construction, and then turned down to cover the flashing below.

Valleys in roofs, the line of junction of two downward slopes, may be finished as open or closed. In a closed valley the slates, tiles, or shingles of one side meet those of the other, and the flashing below them may be comparatively narrow. With a simple, shingle roof it is enough to nail down successive squares of zinc with the diagonal on the valley, each piece overlapping a course of shingles. In an open valley the flashing of zinc or copper is laid in a continuous strip, ex-



Cricket

A small ridge is built up on the sloping roof to throw the rain water away from vertical surfaces and is covered with the flashing which protects the base of the chimney

tending twelve to eighteen inches on each side of the valley, while the slates or tiles do not come within four to six inches of it.

The ridges built up on a sloping roof, where it runs down against a vertical projection like a chimney or skylight, are called crickets. They are designed to shed the rain to either side. As they are out of sight from the ground, they are covered with metal and the flashing is carried out well under the slates or shingles and up the vertical surface to counterflashing.

"Through-flashing" is required at the top of parapet walls or wherever there is a chance of water percolating down inside the construction.

## INTERIOR MASONRY

THE outstanding character of a house, the gesture it makes to the public, is expressed by the exterior; but its intimate personality, the embodiment of its owner, is more

truly seen within the walls. Each piece of furniture, each window-hanging, pictures the life and tastes of the occupants, once the home is established, even more vividly than their clothes or handwriting. Of course, a house bought ready-made takes longer to adapt itself to the family than the home built to order, where the owner-to-be, with the aid of his architect, has sincerely expressed his mode of life.

In determining the dimensions of rooms, the details of stairways and fireplaces, and the materials and workmanship, the just balance of size, quality, and cost must constantly be remembered.

It is the specifications, — the written description of the materials, — rather than the drawings, which must ensure the wearing-qualities of the building. It is the supervision which guards against cracked plaster, peeling paint, short-circuited wires, and leaky roofs. Slipshod specifications will allow a contractor who has no pride in his craftsmanship to use inferior stock and workmanship, despite the owner's intentions when letting the contract. A

few typewritten paragraphs in the specifications may cut or increase by many hundreds of dollars the cost of building from the same set of drawings. It is from this point of view that the following notes on interior construction are offered; but no attempt is made to cover the most interesting fields of general planning or the æsthetics of decoration. That subject is taken up in the *House Beautiful Furnishing Annual*, a companion volume to this one.

The materials which are used in the construction of the interior of a house are usually grouped in the specifications by trades; and of these the more important are masonry, carpentry, plastering, painting, glazing, and hardware. Masonry will be considered first.

In the preceding chapters the exterior treatment was considered. The interior masonry will be subdivided into floors, both structural and as a surface, chimneys and fireplaces, and partitions.

#### **FLOORS**

Real fireproofing in American homes is the exception rather than the rule. It is seldom that both floors and walls are of masonry, but many fire-retardants or precautions should be adopted. As most fires start in the basement, the chief point to safeguard is the ceiling of the cellar. For a true fireproof floor-construction the simplest method, and therefore the one best adapted for the average labor procurable, is the reënforced concrete slab

curable, is the reënforced concrete slab. Such a floor not only is fireproof but is permanent, and gives solidity to the whole house. The material and treatment in general are similar to that of concrete floors, which were described in a preceding chapter on Foundations, and the diagram here given illustrates the floor slab, with its reënforcing rods and concrete beam used as an intermediate support. This masonry floorconstruction is much more expensive than wooden joists except on very short spans. Economy demands that the thickness of the floor slab should be cut down as much as the varying stresses permit. Its thickness and composition and the size and spacing of the reënforcing rods are scientific problems much more complicated than the ordinary foundation walls, which depend on inherent strength. They cannot safely be laid out by rule of thumb.

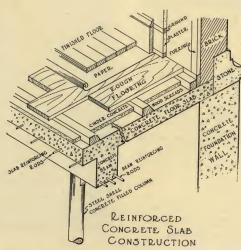
Masonry floor-surfaces may be divided into two groups, (1) those which are spread in a plastic condition, and (2) those which are formed by laying separate units. Concrete, granolithic, terrazzo, and the various types of

composition floors belong to the first group, while tiles come in the second classification.

Concrete. — The masonry floor most frequently used is that of concrete in the cellar, where it rests directly on the ground. The first consideration should be an even, level bearing. The same requirements discussed in the preceding chapter on Foundations, concerning the character of the subsoil, will apply here; but additional precaution should be taken for underground drainage. If the subsoil is coarse sand

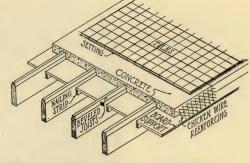
or gravel, there is the least danger of trouble. If, however, it is clayey or liable to hold water, a bed of coarse cinders (and this does not mean fine soluble ashes) from 6" to 8" thick should be spread out and rolled as the bed for the concrete floor. Underground water prefers to follow its natural course. If it meets some impediment like a newly built house with a comparatively open passage beneath it, as through coarse gravel or cinders, it will continue on its unoffending way.

The minimum thickness of the concrete slab, whether set on sand or on clinkers, should be at least 3", but 4" is much less liable to crack. If the floor is very wide or if there is a chance of water in the springtime which may



Fireproof Floor

The concrete slab, poured on a temporary wood platform, is reënforced by metal rods. For wide spans, a concrete beam is needed in addition. Wood screeds are set on the slab and held in place by "fill" laid between them, usually of cinder-concrete, as this is lighter and cheaper than stone-concrete. Screeds and fill are not needed if there is to be a masonry surface



Masonry Flooring on Wood Joists

For bathrooms and the like where tiles or terrazzo are to be laid over frame-construction, the tops of the joists are beveled and boards on cleats are secured between them. The thin bed of concrete should be reenforced with heavy wire to prevent cracking



Brick Floor

In this room, transformed into a basement living-room, the brick floor is laid with continuous joints and is kept well oiled, giving a dark, rich tone and a surface that is easily washed.

Eleanor Raymond, of Frost & Raymond, Architect



Marble Tile For this ground-floor dining-room, opening directly into the garden, marble makes a practical as well as a beautiful floor



Moravian Tile These small unglazed tile in shades of soft reds make an excellent floor, especially for a small room or hallway



Ceramic Tile This floor is of small unglazed squares of ceramic tile, with white glazed wall-tile used as a base. This type of ceramic ware often comes in hexagons and in white, cream, and faintly

mottled effects



Glazed Tile

Both for the walls and for the floor of this bathroom glazed tile have been used. These may be obtained in colors as well as white, and many different effects may be obtained by combinations of colors or by the use of a border, as here

## INTERIOR MASONRY

exert a surprisingly powerful upward thrust, or if there are to be heavy loads of coal or ash barrels, it may be advisable to increase the thickness of the slab or to reënforce it with

heavy wire or small rods.

The mixture of materials for the concrete should range between one part cement, three parts sand, six parts stone, to one part cement, two and a half parts sand, five parts stone. The material should be thoroughly mixed both before and after the water is added to the dry materials, and should be spread over the foundations to the required levels or pitches by the use of leveling strips or rods, that is, narrow strips of wood laid so that their top surfaces come to the exact grade desired, and which are moved away after one section of the floor has been poured and has stiffened.

The cheapest surface on a concrete floor is that in which the rough material is brought to a true level with a wood "float" which works the fine sand and cement to the surface. For a smoother and better-looking finish it is troweled with an iron trowel when nearly dry and ruled into squares about 4' on a side, so that a suggestion of decoration may take away from

the lifeless texture and dull gray color.

Granolithic. — This is a finer, richer mixture, laid on after the concrete has set, composed of four parts cement, three parts sand, and three parts of fine crushed-stone screenings, the maximum size of the fragments to be less than 1/2". It has an average thickness of 3/4" over the concrete, and great care should be taken when it is poured that no dirt or wood splinters remain on the base. After it is laid and floated smooth and divided into squares and borders, it is troweled — as the surface begins to set or harden — to a glossy smoothness, and the edges against the jointing-marks are rounded off. At a slight additional expense coloring matter, either lampblack or special prepared browns and reds, can be introduced. For cement or granolithic surfaces which would receive hard wear, it is well to use concrete hardeners, which are either liquids mixed with the cement or mopped on after the floor is finished, or metallic powders which are troweled into the surface while it is still moist.

The granolithic floor is used for its wearing qualities rather than for its appearance, and in its simplest form is found principally in the basement. It is possible, however, to combine cement with other materials in such a way that a floor that is attractive as well as practical may be obtained, suitable for the porch or plant-room. A simple suggestion for such a floor is alternating squares of cement and bricks, laid in basket pattern in such a way that each side of the square is

made up of the length of a brick and two widths.

Terrazzo. — This is a more ornamental surface than granolithic, and it costs considerably more. It is composed of Portland cement, sand, and marble chips or other highly colored stone, and is laid 3/4" thick on the concrete and floated to a smooth surface. After it is thoroughly dried it is ground down by machine or hand till the top coating of sand and cement is removed and the flat polished surfaces of the marble are exposed. These should extend over about two thirds of the surface. The cement, the sand, and the stone aggregate may each be of a different color, thus allowing a varied decorative scheme. Terrazzo on a hallway or other long area should be laid in separate rectangles, so that any slight settlementcracks will come in the joints rather than across the fields.

Composition. — There are a number of patented-composition floors, often used in bathrooms, pantries, and the like, which are laid with a trowel, preferably over a concrete base, and which are waterproof, pleasant-colored, and softer and warmer than any of the forms described above. They are known by various trade-names and all should be investigated before a choice is made. Most of these may be



Specimen Tiles

Beginning at the left on the top shelf: White glazed wall-tile trim; (in frame) farence in plain colors with decorative inserts; hexagonal and square ceramic for bathrooms; (in frame) hexagonal unglazed floor-tiles; a 9" x 9" quarry tile (this shows the sizes of the other specimens); (in frame) black and white faïence. Beginning at the left on bottom shelf: Faïence decorative tile in colors; handmade variegated buff unglazed floor-tile; (small samples below) 1" x 1" colored glazed faïence; (second and third frames) handmade for floors showing simple patterns; (on top of frame) plain colored faïence; 5" x 5" antique Dutch decorative tile (these come in delft blue or mulberry); 6" x 6" faïence tile grille as used in bathroom walls

classed as masonry, but some are more nearly like linoleum. For these cement is mixed with cork, asbestos fibre, linseed oil, or other ingredients. The best way to judge them is by samples and by examples which have been in use a year or more. Compare the cost when laid, the appearance, and the wearing-qualities. This information should be obtained from

Tiles. — Floor tiles may be of stone or of burnt clay. If of clay the usual trade-names are quarry tile, ceramic

mosaic, faience, and glazed.

QUARRY TILE. - These are large, heavy squares or rectangles suitable for porches, hallways, and loggias. The average thickness is at least 34", and the size varies from 4" x 4" up to 9" x 9". The American makes come in red, cream, and gray, and the Welsh, which are usually slightly rougher, in red, brown, and black. Usually they are machine-made, but if handmade are more expensive, have a rougher texture, are more porous, and are more attractive. Porous unglazed tiles on the floor should be kept oiled, as this preserves the material, deepens the color, and, if rubbed, gives a gloss or sheen. They are usually laid with wide cement joints.

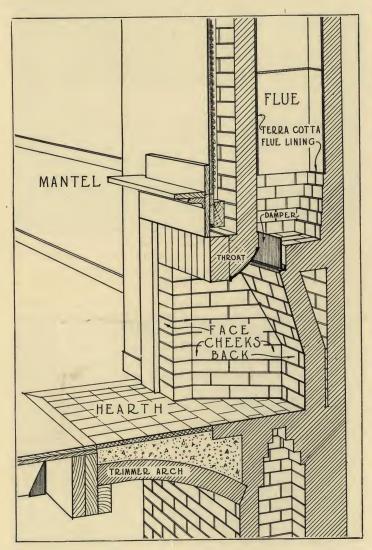
CERAMIC MOSAIC. — The units are about  $\frac{1}{4}$ " thick, about  $\frac{3}{4}$ " square, and 1" hexagonal. They are dense and smooth and are the least expensive tile especially adapted to bathroom floors. They come white, light buff, or in colors, white being the cheapest. Larger sizes are known as vitreous unglazed. These are hexagons or squares from 2" up to 6" in size.

FAÏENCE. — These tiles may be unglazed, but usually have a soft, mottled glaze in a great range of colors, and often have decorative designs or pictures formed by a sunken pattern. Half glazed are those in which the raised portion is the natural burnt clay and the sunken design is glazed. The common sizes range from 2" to 6" square. When larger, or where the ornamental raised pattern is introduced, they come more into the field of ornamental terra cotta.

GLAZED TILE. — These units have a heavy white or colored

glaze which may be finished *bright*, that is with a glasslike surface, or *mat*, with a softer, ground effect. These are really best suited for walls, but are listed here with the other tiles. The average size is  $4\frac{1}{2}$ " to 6" square, and special moulded corners, caps, bases, and built-in accessories (like soap dishes) are finished to match.

STONE. — Marble is the most common material for stone tiles, and white with slight veining of gray or light green is the cheapest. Pure whites or blacks, however, add comparatively little to the total cost of the floor. Sometimes, in picturesque country houses, flags, or thin sheets of bluestone, are used;



### Fireplace Construction

The trimmer arch of brick supports the concrete bed for the hearth. The face may be of brick, stone, tiles, or cement plaster. The two cheeks and the back are beveled, to throw the heat into the room and to lead the smoke up to the throat, which is built around an iron damper, with adjustable gate. Above and back of this is the flat wind-shelf to check cold down-drafts. The terra cotta tile flue-lining is encased with brick. The wood framing for the chimney breast is kept two inches away from the chimney itself and the wood mantelpiece is attached independently of the fireplace

but as these are much heavier than the thin tiles, it is inadvisable to adopt them unless the floor is to be applied directly on the ground.

For the best results, most floor tiles should be laid on a concrete base at least 1½" thick. If this is on wood construction, the tops of the joists should be beveled off, to reduce the danger of cracking the masonry, and a board form should be

laid between the joists to receive the concrete bed. (See the diagram on page 78.)

Tiles of composition not strictly masonry, or made from squares of rubber compounds on cloth, or of linoleum (which is a linseed-oil product mixed with powdered cork and mounted on cloth) may be used on wood floors.

### CHIMNEYS AND FIREPLACES

One of the most important practical elements in the comfort of a house and in its protection from danger of fire is the proper design and construction of the fireplaces and the chimneys. Everyone is acquainted with the discomforts of a smoking fire, but more insidious is the danger from a flimsy flue.

Chimneys. — Good construction demands that a chimney shall not rest upon or be carried in any way by wooden members, but shall have a foundation of concrete or masonry strong enough for the weight imposed upon it; that it shall not come in contact with any frame construction; and that, unless of solid brick walls, 8" thick, it shall be lined to its top with fire-clay flue-lining.

A chimney may be corbeled out from a masonry wall, provided that wall is 12" thick, and provided also that it does not project more than 6" from the wall. Otherwise, a chimney should be built independently, with its own foundation, as stated above. The practice — sometimes seen in a cheaply built house — of carrying a chimney on a wooden beam or bracket, or having its support depend in any way upon wooden members, is to be severely condemned.

All woodwork should be kept away at least 2" from the outside face of the chimney and 4" from the back wall of the fireplace. No studs should be nailed directly on the chimney; and if the chimney is on a line with the studding, plastering should be done directly on the masonry or on metal lath or incombustible furring-material. For the baseboard or other trim in such a case, an asbestos paper should be used between the wood and the masonry.

Each range or furnace or fireplace should have its separate flue extending to the top of the chimney. For small stoves and heaters, the minimum size for the flue is 8" square; but for a furnace, or for a medium-sized fireplace where wood is to be burned, it should be at least 8" x 12". If less than 6" in any dimension, the flue is liable to become choked with soot or to have a bad draft. As a fire protection, and to ensure a smooth flow of the heated gases, the flue should be lined with fire-clay linings, which can usually be obtained in stock sizes. Linings are set up and the brick or stone chimney built around them as the work goes up. If flue-linings are not used, the brick wall, as already stated, should be at least 8" thick, and particular attention should be paid to make sure that all the joints are filled with a strong cement mortar. A precaution against the leakage of cold air and the consequent interference with the draft inside the chimney, or against a leakage of heated gases and a danger of fire outside the chimney, can be taken by cementing over the outside of the brickwork, especially in the attic space where it passes through the roof. Abrupt turns in the flues should be avoided.

Chimneys should be carried at least 3' above flat roofs and 2' above the ridges of peak roofs, as an insurance against wind eddies and down-drafts. It is well to cap the masonry forming the sides of the flues with a slab of stone or cast cement. This prevents rain from percolating through the masonry and disintegrating the joints. If a stone cap is used, it is well to build of cement a beveled edge toward the flues, to prevent downward currents of air. If a cast stone or cement cap is used, this should have the top surface beveled in the same manner. Sometimes, where there are adjoining buildings or high trees that interfere with the draft, it is necessary to

### INTERIOR MASONRY



Brick Facing

Old brick of small size and of soft uneven tones make a better fireplace-facing than new brick mechanically even in size, texture, and color. Edward Spencer Guidal, Architect



Cement Facing

Cement makes an excellent facing for the fireplace. It may be tinted in color or made dark gray with lampblack. Notice also the bluestone floor. Clark & Walcott, Architects



Marble Facing

The pure whiteness of this marble, colored only by the few veinings, accords very well with the simple woodwork. Edmund Gilchrist, Architect



Tile Facing

For this type of mantel treatment decorative tiles, either old or new, add color. Here they repeat the paper borders used as panels on the walls. F. Patterson Smith, Architect



Exposed Brick

This chimney breast, with brick exposed, besides being of excellent color is given interest by the long pointed-arched niches in which candlesticks are placed. Eldred Mowery, Architect

use a chimney pot or hood to maintain proper draft; those of terra cotta are more lasting and better-looking than those of metal.

When the chimney extends through the roof, there should be metal flashing to prevent leaks — a subject that is discussed fully in the chapter on Roofs, page 77.

Fireplaces. — The proper construction of a fireplace has developed from long experience, which has resulted in a structure designed to eliminate smoking and the spreading of fires. A smoky fireplace is a wrongly constructed fireplace. Although definite rules to prevent smoking cannot be given, there are certain requirements that should be fulfilled. The flue should have the proper area, which for the fireplace of usual height should be 1/10 that of the fireplace opening. If, however, the fireplace is higher than the usual 30", the flue should be enlarged. The throat should be correctly proportioned, that is, it should not in cross section have an area less than that of the flue, and it should be correctly located. There should be a smoke shelf the full length of the throat, not less than 4" deep. These features are all indicated on the diagram on p. 82, which shows a typical chimney-breast, partly cut away to reveal the interior arrangements.

To safeguard against the spreading of fires, the fireplace walls should be not less than 8" if of brick, and 12" if of stone. Hearths should extend at least 20" into the room, and no woodwork should be less than 8" from the fireplace-

Fireplaces are usually constructed of brick, as the shape can be readily built up and as the material is fire-resisting. The face, which is not exposed to heat, can be veneered with marble or stone or coated with cement plaster as a matter of decoration. The back and sides can be lined with cast iron,

either for ornamental purposes or where it is desired to cut to a minimum the depth of the masonry. The sides or cheeks are beveled, to assist in narrowing down the construction of the throat and to throw the heat into the room.

The entire fireplace-throat and gathering-chamber may be built of masonry; but where an iron throat and damper can be obtained, the efficiency and the ease of the construction will be assured with practically no added cost.

The hearth directly below the fire should be of brick to resist the heat; but where it extends into the room it may be of brick or stone, built upon a half-arch of brick or concrete—called the trimmer arch—which is constructed against the floor-framing.

#### **PARTITIONS**

The building of the interior walls of masonry increases the expense, but helps prevent the cracking of plaster and the settling of floors due to the shrinkage of wood framing, and it increases the resistance to fire. Often the basement walls, which will carry the first-floor framing and which are not cut up by many doors, can be economically built of brick and concrete and greatly improve the value of the house as a whole. In a house costing not over \$30,000 the interior walls above the basement are seldom of masonry; but light partitions can be made of 4" hollow blocks of hollow tile or gypsum, to which the plaster is directly applied. These are especially desirable where the walls are to be lined with tiles, or where protection against fire is needed, as behind a kitchen range, or in the sides of a built-in clothes-chute, or cutting off a garage attached to the main house. The most effective substitutes are metal lath and plaster, sheet metal, or asbestos boards; but a study of the local building-laws (if such exist) is necessary before the decision is made.



Wooden Lintel

With a properly constructed fireplace a large wooden beam can be used, as this is, with safety. John F. Staub, Architect

## CARPENTRY

In the construction of American homes, wood still plays the major part. Almost never are the doors and window frames metal, the floors fireproof, and the stairs masonry. And for the varied members, some structural and others ornamental, some hidden behind walls and floors and others not concealed even by a coat of paint, there is a selection to be made of the kind of wood suited for the purpose and treatment and the grade of wood which is a just compromise between the best and the most economical. For the small house, stock designs and stock sizes should be used as far as possible. This will greatly reduce the cost, and yet the range of choice is so wide the artistic effect need not be lowered. Many mills have had excellent architectural aid in simplifying and standardizing their patterns, and with a little care the various elements can be combined to obtain the silhouettes and scale desired.

In the specifications, carpentry work includes: temporary stairs, screens, scaffolds; framing of wood floors, walls, and roofs; rough boarding on them; doors and windows; exterior finish, such as cornices, piazza posts, and railings; interior finish, such as baseboards, chair rails, and wainscoting; stairs, with their rails and balusters; finished floors.

# TEMPORARY STAIRS, SCREENS, AND SCAFFOLDS

The general contractor supplies for his own use the staging and scaffolding and temporary stairs as a matter of course; but in a house of any size — especially where subcontractors may be engaged, as for the plastering — it is well to have the specifications explicit as to who furnishes the above items, in order that the expense involved may not be included twice in the estimates. If temporary cloth-screens are required for the door and window openings to allow the work to proceed in cold or rainy weather, their use should be called for in the specifications.

#### **FRAMING**

Types. — There are two general types of framing or assembling of the structural members, the braced and the balloon. There are variations of both of these and each type has its advantages and disadvantages.

THE BRACED FRAME. — In the Eastern States this method of framing is the one chiefly used. It has developed from the early half-timber construction of the colonists, who in turn brought the tradition from the mother country. In the early days the framing timbers were often hewn from near-by trees, and much heavier pieces were employed than were necessary. Because nails were handmade and scarce, mortise and tenon joints were used. The braced frame in use to-day is similar in form, but is made up of timbers more nearly adjusted to the loads or thrusts they have to support, and they are fastened together with nails. The special features of the braced frame can be studied best by means of the illustration. In general, it has corner braces to stiffen the framing, and girts at the second story, on which the second-floor study rest.

THE BALLOON FRAME. — This type of framing was developed principally in the West, where quicker methods were deemed desirable. As the illustration shows, its studs run unbroken to the plate, and a ledger board, notched into them at the second floor, supports the floor joists. In its least desirable form it has no corner bracing, and its inside parti-

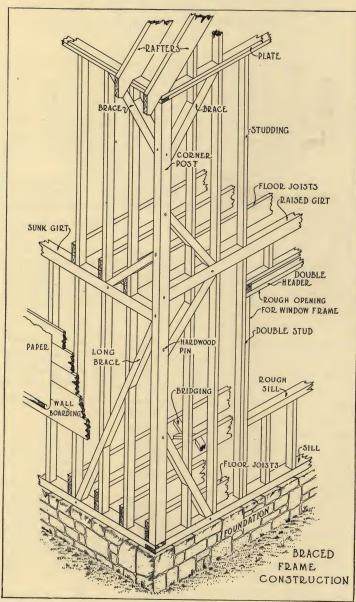
tion-studs rest on the under floor, instead of on a girder as in the braced frame.

Structural members. — The principal timbers used in framing are as follows: —

sills. — The beams placed flat on the foundation walls to form both a level bearing-surface and a bottom tie for the uprights. The common size is 4" x 6".

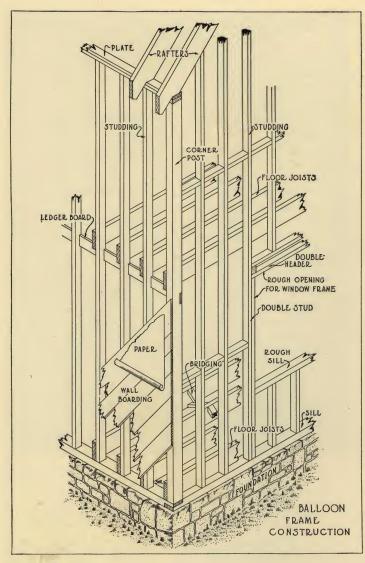
GIRDERS. — The heavy beams that support the joists and studs at an interior partition. In section they average 4" x 10" or larger.

JOISTS. — The beams to support floors. They range from 2" x 6" to 3" x 14" in size and are spaced 10" to 16" apart. They are set on edge, so that their maximum strength is developed.



Braced Frame

The typical braced frame had heavy timbers jointed together; the modern development often uses smaller lumber and nails. The diagonal props at the corners and the girt at the secondfloor level are characteristic



Balloon Frame

One distinguishing feature is the wall studs, extending two stories in height, with the second-floor joists spiked to their sides and resting on a ledger board (sometimes called ribbon board). Fire-stopping is needed between the ends of the joists and between the studs at the floor line

BRIDGING. — Short diagonal braces, 2" x 2" or less, spaced about eight feet apart, set between the floor joists to hold them vertical and to distribute concentrated floor-loads.

POSTS. — Vertical supports — usually at corners — for girts and the like, and larger than studs, the size being ad-

justed in each particular case. Also the vertical members which support the girders and in turn rest upon concrete footings. The more common practice substitutes concrete-filled steel shells for this latter purpose.

studs. — The vertical framing members of walls and partitions, ranging from 2" x 3" — for interior walls — up to 4" x 4" in section, according to their height and the weight they have to carry; 2" x 4" is the most common size. When wood lathing is to be nailed to them, they are spaced 16" on centre, — often abbreviated in specifications to o. c., — and when metal lathing is to be used, 12" on centre.

PARTITION CAPS. — These are set on top of the studs over interior bearing-partitions, and in turn carry studs of the floor above. They are usually 3" x 4" in section.

GIRTS. — The supports of the vertical framing between the first and second floors, and for the second-floor joists. In

section they are usually 4" x 6".

RIBBON BOARDS. — The boards notched on the inside of vertical framing to support second-floor joists. In the balloon frame they take the place of the girts.

PLATES. — Set singly or doubly at the top of the studs to support the lower ends of the rafters. Commonly two 2" x 4"

are used.

RAFTERS.— Used in roofs and set on edge like floor joists. As the roof loads per square foot are usually less than floor loads, the rafter sizes average smaller than joist sizes.

PURLINS. — Horizontal members about 2" x 4" thick, set between rafters to form the openings in the roof-framework

around chimneys and skylights.

PRIDGEPOLE. — A timber about I" x 8", set on edge at the peak of the roof, to receive and keep in alignment the upper ends of the rafters.

#### **MATERIALS**

The value of a building and its rate of deterioration are largely determined by the care of lumber before its use, and its condition when placed in the building. Green lumber contains a considerable quantity of moisture, which makes it unsuited for building purposes until a large part of it has been removed by drying. Lumber is dried by stacking in such a way that it will be exposed to the air for several months,—or even years,—or else it is dried in a kiln for several days or weeks. Much lumber is dried by both methods. Lumber to be used for framing need not be so thoroughly dried as that for interior trim, doors, and floors. For the latter, properly kiln-dried stock should be specified.

It is important that green or partially dried lumber, when brought to the building-site, should be carefully stacked; otherwise, it will twist and warp in drying and retain this defect. Also, unless it has a free circulation of air it is likely to become infected with dry rot, which will continue after it

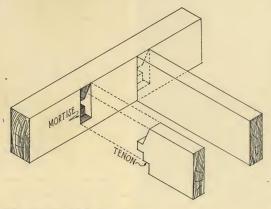
has been placed in the building.

To give assurance that their quality is dependable, the lumbermen, in coöperation with the Government, have adopted a set of standards known as American Lumber Standards. These standards do not recognize for ordinary uses boards dressed to a thickness of  $^3/_4$ ,  $^{11}/_{16}$ , or  $^5/_8$  inch, such material having been found to be generally unsatisfactory in the long run for general utility purposes.

Usage has applied two general terms to our woods: the hard woods from broad-leaved trees, and the soft woods, or

conifers, from trees with needle or scale-like leaves. These terms are confusing, however, as some soft woods, like yellow pine and tamarack, are harder than many of those classified as hard woods, and some hard woods, like cottonwood and basswood, are almost as soft as the softest conifers.

The kind of wood to be used in framing depends on its inherent strength and its availability. The following classification, made by the Government, shows the relative durability of different woods commonly used in building, but it must be remembered that woods vary in this respect, and exceptions to this rating may be found.



Mortise and Tenon Joint

Where an end of a beam is cut notched to fit tightly into another

### RELATIVE DURABILITY OF COMMON WOODS

#### Conifers

Very durable Cedar, Northern white Cedar, Western red Larch, Western Cypress Redwood

Durable Fir, Douglas Tamarack Pine, long-leaf Pine, Eastern white

Intermediate Nondurable Hemlock, Eastern Firs, true Hemlock, Western Spruces

Pine, loblolly Pine, Norway Pine, short-leaf Pine, sugar Pine, Western white

Pine, Western yellow

Hard woods

Chestnut Walnut, black Locust, black

Cherry, black Oaks, white

Ash, white Butternut Gum, red Poplar, yellow Oaks, red

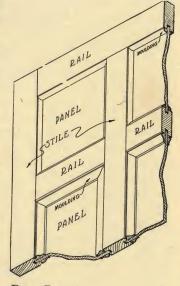
Basswood Beech Birch Buckeye Cottonwood Elm, white Maple, hard Maple, Oregon Maple, soft Sycamore

Cotton gum

The use of woods for framing and other purposes varies in different parts of the country. For instance, whereas white spruce is used in the Northeastern states for many of the framing timbers, Douglas fir is just as common for the same purpose in the Western states and Southern yellow pine in the Southern states. The choice of wood for framing depends upon local woods available and upon the amount of work to be done by the member for which it is to be used. The last consideration determines the quality of wood to be chosen and the size of the structural timbers — a matter to be decided by the archi-

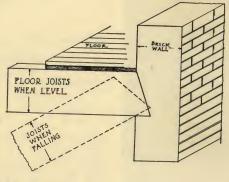
Materials Other than Lumber. — Of late years, several new materials have been introduced to provide cheaper and quicker methods of covering walls and ceilings. Various

fabricated materials are on the market whose chief ingredients are wood pulp, plaster, asbestos, laminated wood, paper, and vegetable fibres. These can be obtained in large sheets at least 4' x 8' in size, which may be cut to fit and then nailed in place. Their characteristics vary with the materials of which they are made, but they all supply in different degrees a fire-resisting, insulating material which, in most cases, can be nailed directly to the studs, thus eliminating laths, and used either instead of plaster or as a base for plaster. Some are advocated especially for their insulating properties; these are discussed in the chapter on Heating; others, for their qualities of sound-deadening and non-



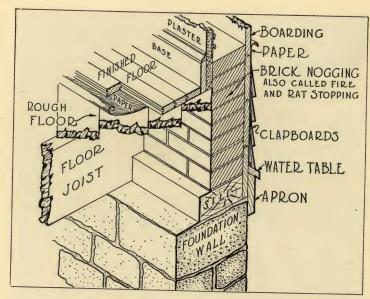
Door Detail

The framework of the ordinary door is built up of rails and stiles; the panels are held in the rails and stiles loosely enough to allow a slight expansion and contraction



Fire Cut Joist

Joists should be splayed at the ends when built into masonry so that they may drop when burned without detriment to the wall



### Fire-stopping

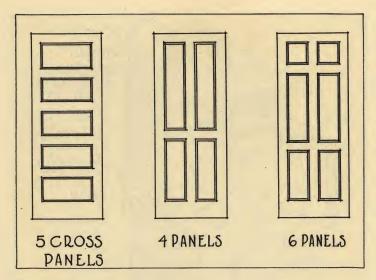
This diagram shows the brickwork which has been built along the inside of the wall at the main floor level. It fills the space between the ends of the floor joists and between the sill and the floor line

absorption of moisture. Some may be left in their natural finish, others should be painted or stained. Some manufacturers recommend their product as a satisfactory surface for papering; others advocate the use of mouldings applied at the joints to form paneling. These materials all have their uses and should be investigated by the home-builder before a final decision on interior finish is reached.

#### CONSTRUCTION

The satisfactory house not only is attractive in appearance; it must be well built. Such a statement would seem trite did not jerry-built houses all over the country give evidence that there is not as yet a sufficient demand for high-class construction in connection with the smaller house to make low standards unprofitable. It is necessary then that the home-builder should know what constitutes good construction, and should realize that nothing else pays. Throughout this book its importance is emphasized, and various details are mentioned in their proper places. Thus the correct method of laying foundations, of applying stucco, of building a chimney, and so forth, are discussed in chapters devoted to those subjects. It is necessary here only to mention the details that come within the province of the carpenter.

Strength and Stiffness. - As roof rafters do not have such a heavy load as floor joists, the timber does not have to be so strong and the less expensive qualities can be safely used. Usually the determination of sizes of joists for normal rooms and corridors is based on common practice; but in a large building, and especially with rooms of unusual width or with heavy loads due to billiard tables or the gathering of a number of people, the strength of the joists should always be calculated and their sizes and spacing determined, not only for structural safety and stiffness, but also for economy in materials used. Careful study will prevent undue weights of lumber, but it is best to err on the safe side, to prevent settlements and plaster cracks.



### Door Designs

Here are pictured three standard designs. The one at the left is especially suited for openings where one glazed panel is desired, while that at the right suggests the Colonial period

Joists should have a bearing or end-support of at least 3", and be fire-cut or splayed at the ends when built into masonry. They should have bridging or cross braces of wood securely nailed to keep the timbers vertical and firm. Long



#### Beamed Ceiling

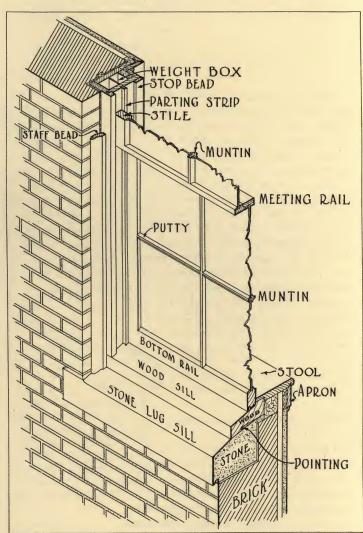
Hand-hewn beams, whether indoors or out, give interest and vigor to a house; but beware of the light-weight box imitation, the obvious product of the planing mill. Here there is no question that the beams are structural members. Peabody, Wilson & Brown, Architects

joists may be crowned, that is, have the top edge cut down from the centre toward each end about a quarter-inch in seven feet; this counteracts any deflection in the floor and gives a more level surface, but it adds appreciably to the expense.

The cutting and notching of joists to accommodate pipes may weaken a floor considerably. When possible, the direction of the joist should be parallel to a horizontal run of pipe; otherwise, the pipe should run through the centre of the joists, to avoid weakening them and to provide a good nailing-surface for the floor.

Studs should be doubled at doors and windows, as should also the headers or horizontal members carried across the top of the opening. Placing the latter on edge will give further strength.

Sills should be firmly anchored to the foundation walls and



#### Window Detail

Here a double-hung window has been cut through to show the meeting of the upper and lower sashes and their method of fitting into the window frame. The relation of the frame to the masonry wall and the interior and exterior trim are also indicated

should be at least a foot above ground. If nearer than this, they should be coated with creosote. This is especially necessary in the Southern states, where there is danger from white ants that live in wood near or in contact with the soil.

Shrinking. — Wood shrinks across the grain, that is, in the direction of its annual rings, and although this shrinking can be minimized by the use of thoroughly dried lumber, it cannot be entirely eliminated. In framing it is important to have the

area in cross section of the horizontal timbers equal in the outside and inside walls. Unless attention is given to this matter, there is apt to be a greater amount in the outside walls, with a consequent sagging of the interior walls, resulting in cracked plaster and twisted doors.

Fire-stopping. — To prevent fires from spreading, fire-stopping should be used at all floor levels and in the stair construction. This consists of building with masonry around all floor-timbers where they enter walls, to prevent flame from passing up in the air space behind the plaster, and once in each flight between the stringers of wood stairs and between the floor joists where one wood-stud partition is directly over another. This fire-stopping also serves as *rat-proofing*, for mice and flame have a facility for climbing up through the same hidden wall-spaces. To help keep out the rodents, special care should be taken that cellar walls and ceilings are tight, and that no openings are left where wood and masonry meet.

#### ROUGH BOARDING

Rough boards are laid on the outside of the framing of a wooden house as a backing for the clapboards, shingles, or brick veneer; above the floor joists, to give an even bearing for the finished floors; and on the roof rafters, to form a bed for the shingles, tiles, or slate. These boards are technically neither part of the framing nor part of the interior finish, and they are never seen after the building is done, except in some unfinished section of the attic. In the rough boarding the cheapest materials are used on the roof. Matched North Carolina pine roofers, <sup>7</sup>/<sub>8</sub>" thick and not over 8" wide, millplaned on one side, would form a standard sufficiently good for any reasonable needs. The boarding should be thoroughly nailed on all bearings under it, not only as a firmer support for the roofing material, but as a brace for the rafters.

For the under flooring sound, seasoned, dry, square-edged spruce or hemlock boards, 7/8" thick, not over 10" wide, mill-planed on the upper side, laid closely together and thoroughly nailed on all bearings, are an acceptable standard. If the under flooring is nailed diagonally on the joists, it requires more cutting at the ends, which means an added expense of labor and material. This is not necessary, but, on the other hand, it does add greatly to the stiffness of the framing and somewhat to the evenness of the finished floor. If a diagonal floor is not specified, the under flooring will be laid at right angles to the floor joists, and in this case the upper flooring would be laid at right angles to it.

Insulating lumber. — Recently there have been put on the market fabricated materials which combine sheathing and insulation. Over these can be put clapboards, shingles, brick veneer, and stucco. These combine in varying degrees strength, insulation, and fire-resistance.

### DOORS AND WINDOWS

Doors. — The various parts of a door and its framing are shown upon page 87. The classification of the door itself should include the material, the number of panels, the type of mouldings, and the direction in which it swings, that is, whether right- or left-handed. Doors may be of wood, of wood covered with metal, or of metal. Except for a readymade safe, all-metal doors are not used in a house costing less than \$30,000. Tin-covered doors, however, are often used in residences as a precaution against fire in furnace rooms or dumb-waiter shafts. In the cheapest form the tin sheets are interlocked at the edges to form a smooth surface covering one or both sides. If a better-looking effect is desired at a slightly increased expense, the sheet metal is drawn over the stiles, rails, and panels, and the mouldings can be made to

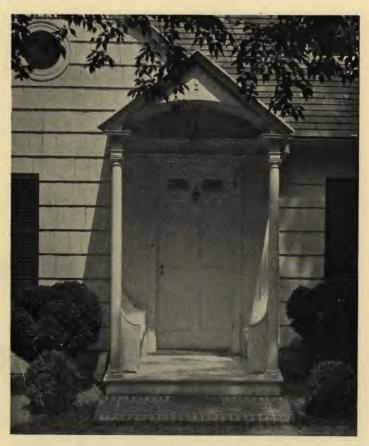


Wooden Casements

Casement windows add to the attractiveness of this California house. Dean & Dean, Architects



Metal Sash
A special hinge swings this window in such a way that, when open, both sides may be easily reached



Exterior. Trim

This porch and entrance demonstrate the charm of simplicity and the value of careful attention to details. Charles S. Keefe, Architect



Door Trim

The stock material used for this door shows the delicacy of some modern millwork. Charles G. Loring, Architect

match the other wooden doors. For this better class of work the name "Kalamein" is used frequently in the trade.

Light wood doors are made up in stock designs for the conventional heights and widths of openings, at a saving over those made to order, and are recommended for the small house. For an interior door over 13/8" thick, or for one with any special refinement of detail, the architect should make drawings. The cheapest wood for interior doors is fir; the next is North Carolina pine. A built-up or veneered door has a core, usually of pine, with a thin layer of ash, beech, oak, or special pine about 1/8" thick, glued on the surface. The thickness varies from 11/4" for small interior openings to 21/2" for large exterior entrances. It is better not to use a veneered door if it is to be exposed to the weather. The doors of barns and garages, or of unusual designs in houses, like those made up of rough planks set vertically, cannot be included in a general classification.

PANELED DOORS. - The five-cross-panel type and the four-vertical-panel type shown on page 88 are the most common and usually the cheapest, but many other designs can be obtained from stock. The panels are usually flat, except in one-panel doors, when they are raised, that is, with what might be called beveled edges. Laying aside the question of cost, the pattern employed depends on the architectural style desired. A flush-surface door - without panels or mouldings — is favored for hospitals, as being more sanitary, but is rarely used in small residences. If properly constructed, it is much more expensive, because it does not have the panels fitting into the stiles and rails, which allow for easy shrinkage and expansion. The flush door must be very carefully built up, with the strip of the core and the sheets of the veneer accurately fitted, permanently secured together by joining and glueing, and with the fibres in the different pieces of wood running in opposite directions one from another, so that the stresses will be neutralized.

DUTCH DOORS. — The Dutch door is divided horizontally and so hung that either half can be opened independently of the other. This arrangement is often a convenience and it also gives a touch of interest. It is slightly more expensive than the single door.

GLAZED DOORS. — The plans or specifications should note accurately where glazing is to occur. The simplest type of glazed door has one cross panel glazed with a single pane 12" square. This type of door is often used in the service part of the house, for convenience. From this type the glass surface may expand till the wood is merely a supporting frame, as in the French window.

Windows. — No review is permitted here of the charm and beauty of fenestration, of "magic casements, opening on the foam," of stained glass of the Middle Ages, or of the artist's studio window. Instead, the trade names and — above all — the methods of keeping the rain out are the subjects to be considered. Whether the casement or the double-hung window is to be used depends upon the type of house. Fixed sash, which occurs seldom except in transoms or sidelights at doorways, needs no special comment.

DOUBLE-HUNG WINDOWS. — The essential parts of the double-hung window are the framing and sash. The rough frame may be built in the walls as they are going up. Later, weights — which are usually cast iron but sometimes of more expensive lead, when it is necessary to economize in the size of the weight-boxes — are hung in the weight-boxes by sash-cords or sash-chains. Strong woven cords of excellent quality should be employed; but if the window is more than usual size sash-chains will prove a safeguard against expense and trouble later. The cords or chains should pass over pulleys which should be at least 13/4" in diameter, pref-

erably with brass or bronze faces and bearings to prevent rust. The isometric drawing on page 88 shows the various parts of the window, frame, and sash.

The sash should be of white pine, not less than 11/4" thick and preferably 15/8"; the meeting-rails should be rabbeted or checked to prevent the passage of air and rain water; the muntins are usually moulded as shown in the drawing, rather than square-sided, and are rabbeted, that is, cut out to receive the glass. Pockets, that is, loose sections of the pulley stiles, should be cut out and then reset with brass screws, to allow access to the weights, should it be necessary to replace the cords. All of the sash and frame except the pulley stiles should be primed, that is, should be given a first coat of lead and oil, before they are built in, to prevent weathering and decay. The pulley stiles should be oiled.

Window glass is cut in inches, and to save money it is well to note this in determining the size of the openings. For example, a double-hung sash where the panes are 8" x 10", with three lights wide and four lights high, would have a sash-opening 2' 4" wide and 3' 10" high. This allows for a sides-and-top rail 2" wide, bottom rail 3", and meet-

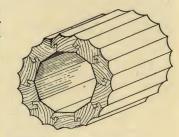
ing rail 15/8" wide.

CASEMENT WINDOWS. — When the sash is hinged at the side to open either

in or out, it is known as a casement window, as differentiated from the sash which slides and is known as the double-hung window. A sash which is hinged at the top or bottom is almost never used except over a door or window, when it is referred to as a transom.

Casement windows may have one, two, or more sashes, which may open either in or out. If the sash opens out, it prevents the use of blinds except when the window is closed and then only by a special fastener; and it means that fly screens must be placed on the interior. It simplifies the formation of the bottom rail of the sash and the sill of the

frame in protection against rain, but it also means that the sash when open is itself more exposed to the effects of rain. If the casements open in there will be no trouble with blinds and fly screens; but special care must be taken for the placing and arrangement of window shades and hangings. It is more difficult to design a rainproof sash, and considerable space is needed for the swing of the sash inside the room. Balancing the de-



Interlocking Joint This diagram shows the method of building up a wooden column

fects and advantages of the two types, the casement window which swings out has been found the more satisfactory. Arrangements for preventing leaks at the bottom of the windows should receive careful attention. There are several forms of lever catches for holding the sash firmly closed and of arms for holding the sash open.

Several firms in this country manufacture all-metal case-



Shutters

The unsophisticated wood shutters are in character here with the sturdy trellis and wide shingles. Mowll & Rand, Architects

ment windows and others import foreign models. These cost more than the wood sash, but are permanent and very attractive when installed in an appropriate style of architecture.

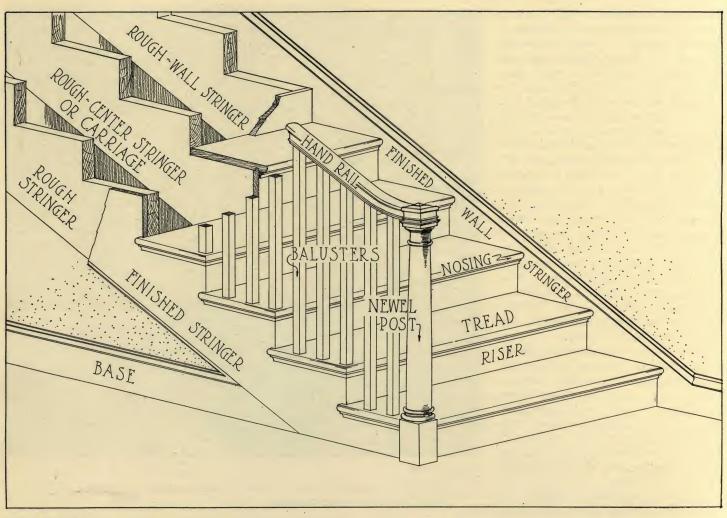
Multiple casement windows can be built on the principle of a folding screen, and very satisfactory special hardware is placed on the market for just this use. The sashes run on light tracks or grooves, and can be folded back against the ends of the window frame. This arrangement gives a wide opening, well adapted for porches or where an unobstructed area or view is desired without the vertical mullions which would be required to form separate individual units. Practically no additional expense is involved for this kind of window, but care must be taken that the framing above the window is amply strong to prevent sagging at the top, which would bind the sash.

One ingenious form of casement-hinge pivots the sash near one end, so that when it swings open both sides can be easily reached for cleaning.

### **EXTERIOR FINISH**

For the sake of simplification, a chapter on Walls discusses the main surface of the outside of the wooden house, including clapboards, siding, and shingles; but in the specifications which go to the contractor it is customary to include the exterior and the interior work in one group, and it is for this reason that the item of exterior finish is included here.

Aside from the wall surface in a wooden house, there are cornices, piazzas, and smaller items which might also occur on a masonry house. Such trim has a utilitarian basis, but through long use has been developed into conventional forms of ornament. Take for example the typical cornice: this serves as the supporting form for the gutter for the rain water from the roof, as a protection from wind and weather under



### Stair Detail

This diagram may serve as a reference index to the component parts of a staircase. At the left, the structural members are exposed to view. Here an "open" stringer is shown; had the top of the finished stringer run parallel with the bottom, it would have been termed "closed"





#### Stairways

These two examples of simple stair treatments show different methods of terminating the hand rail, the curving of the rail at the left to form the newel and the simple post at the right being each in character with its setting. Shepard & Stearns and Alfred Hopkins are the architects respectively

the eaves where the roof and walls join, and as a partial shelter from the rain at the top of the walls. Such functions must be kept in mind when designing the cornice, but it is the appearance which will finally determine its size, shape, and position. The chief precautions of proper flashing, thorough painting, and careful assembling must be taken to ensure the preservation of the wood against the insidious but constant changes from wet to dry and from hot to cold, and the resultant expansion and contraction of the lumber.

Such precautions against the weather in the jointing of the different members are most highly developed in building up an interlocking wooden column. If a post 10" to 12" in diameter were turned out of a single block of wood, "checking" or long deep cracks would appear as it dried. If it were built of small sections, merely nailed together, they would warp and separate. As any crack or imperfection in a smooth white column at the level of the eye is particularly noticeable, it has been found that the best method of building up a wooden column is by means of an *interlocking joint*, shown upon page 91. Columns of this kind can be bought from various mills over

the country, cheaper and of better construction than they can be made up locally. The best of these columns are designed on classical lines with an entasis or slight swelling which diminishes toward the top, and if such a shaft is cut down from a stock length the proportions are often destroyed. Square posts are, therefore, better for the inexpensive house.

Porch railings of simple construction are the best, and economical stock-patterns are available; but these must be selected with care, as many planing mills still delight in ornate and ostentatious designs for all their wares.

Window blinds should have the framework 11/8" thick and it is well to have the stiles or side pieces extend below the bottom rail, to allow rain water to escape between the blinds and the sill of the window.

### INTERIOR FINISH

Interior finish often includes doors and windows, but particularly refers to what is known in the trade as standing finish and fittings.

Standing finish. — This includes the following: —

casings. — The exposed coverings of the rough frames for doors and windows, and of stairways.

BASE OR BASEBOARD. — The wooden member, anywhere from 4" to 8" high, on the wall at the junction with the floor, either with plain top beveled, or with a strip of simple moulding at the top.

DADO CAP or CHAIR RAIL. — A plain or moulded member 4" to 6" wide, which is run around the walls both for decorative purposes and as a guard to prevent the furniture from marking the paint or paper.

cornice. — A moulding which forms a decorative transition from wall to ceiling. Often a picture moulding is used alone for this purpose.

WALL MOULDINGS. — Wood strips applied to plaster walls to form decorative panels.

"The simpler the better," in the case of interior finish, as in many other instances, is a safe rule from the point of view both of looks and of price. Often all that is needed for the door and window trim is a plain board casing 3/4" thick and



Built-in Furniture

These two corner cupboards add to the fancifulness of this charming diningroom. Eldred Mowery, Architect

3<sup>5</sup>/<sub>8</sub>" wide, with gently rounded corners and with a head casing at the top, slightly wider, crowned with a cap moulding. Such a trim does away with the mitred corner, which in cheap work and with improperly seasoned wood is sure to open up. To match this trim the window stool and the apron under it should be equally plain and should also have rounded edges.

Fittings. — Fittings, or miscellaneous interior finish, include the carpentry work required by other trades, such as strips for plumbers' pipes; covers for "chases" or recesses in masonry walls; radiator cleats or supports; covers to electrical panel-boards, and the like. It is important that these should be covered by the specifications to avoid disputes between trades. Fittings also include many items of more constant interest to the housekeeper, such as the drain boards and box around the sinks; the shelves and the strips for clothes-hooks in closets; the cases, drawers, and cupboards in pantries, china closets, and linen closets; built-in bookcases and window seats; wood mantelpieces; paneling; medicine cases; radiator enclosures.

Built-in furniture adds greatly to the small house and although it increases the contract price, nevertheless, the same features would often be more expensive when purchased later, item by item. These are discussed more fully on pages 118–123.

Painting and Staining. — For painting, the woodwork should be whitewood or white pine; gumwood is next choice, but it may twist. For staining, use hard woods with an oil stain and wax finish, or North Carolina pine when a more informal picturesque effect is desired. Above all, mill-work should not be installed until the plaster has dried out; and it is best to give it a priming or filler coat all over, before or as soon as it is received at the building. This subject is discussed more fully in Chapter XIV on Painting.

### STAIRS

In the range of domestic architecture touched on by this volume, the stairs and balusters are of wood. See page 92.

Parts. — The trade names for the various parts are as follows: —

RISER. — The vertical face of the steps.

TREAD. — The horizontal foot-rest.

stringer. — The sloping side which either is cut away along the line of the steps, — called open, — or follows a diagonal line just in front of the outer edge of the steps — called closed.

soffit. — The under side of the steps, which is usually furred-out, lathed and plastered, or paneled to form an even sloping surface.

NEWELS. — Posts at the start and at angles in the handrail.

BALUSTERS. — Upright members which support the handrail.

HANDRAIL. — The sloping member on the balusters.

The comfortable ratio of width of tread to height of riser has been found by long experience to work out in a simple rule of thumb: twice the height of the riser in inches plus once the width of the tread should equal twenty-three inches; or, put in tabular form:—

TREAD	RISER	
7"	8 "	Cellar stairs
8"	$7^{1/2}''$	Back stairs
9"	7 "	Front stairs
10"	$6^{1}/_{2}''$	Entrance steps
11"	6 "	Terrace steps

### FINISHED FLOORS

The desirable qualities in flooring are hardness, even covering, and freedom from slivers. The hard woods most satisfactorily fulfill these requirements, but certain soft woods are sometimes used, either for the sake of economy or, in greater widths and painted, to reproduce an effect common to old Colonial houses.

Floor Materials. — The most common woods for finished floors are mentioned below in the order of cost. Of these the first two are classified as soft woods and the others as hard woods.

PINE. — This should be the best grade Southern or Georgia hard pine, rift or quarter-sawed to prevent flaking or splintering. The usual width is from 2" to 5". Lately the price of



Kitchen Fittings

Either units ready-built, or specially designed cupboards are indispensable in the kitchen. Tyson & Foster, Architects

pine has gone up, so that the finer woods cost very little more.

DOUGLAS FIR. — This wood is used largely in the West for a soft-wood flooring. It too should be quarter-sawed to prevent splintering.

BIRCH AND BEECH. — These are the cheapest of the hard-wood floors. Their original color is not so fine as the best grades of maple or oak, and the texture of the wood is not so firm, but they form very serviceable flooring, and can be easily stained.

MAPLE. — The Standard Grading rules are explicit regarding the qualities and defects to be expected from Clear, No. 1, and Factory stock; price varies accordingly. The average thickness is  $^5/8$ " and the serviceable width,  $2^1/4$ ".

OAK. — There are two kinds of oak — white and red; but in choosing between these, personal preference for the shade of color is about the only guide, as the wearing-qualities and price in each case are nearly the same. <sup>13</sup>/<sub>16</sub>" and <sup>3</sup>/<sub>8</sub>" are the standard thickness (the latter used for new surface on old floors), and widths range from 1<sup>1</sup>/<sub>2</sub>" up.

With finished floors, the narrower the exposed surface and the thicker the flooring the more expensive the work and the better the results, as the likelihood of warping and cracking is reduced and the solidity of the floor is increased.

The finished flooring should be thoroughly kiln-dried, and should be kept in a local dry house or in some heated enclosure free from moisture, and not brought to the building until all granolithic, plaster, or other material which requires water in its preparation is thoroughly dried out, and not until the under floors are ready for the laying of the finished material.

Laying and Finishing. — The finished floor is laid over the under or sub-floor, which preferably is laid diagonally over the joists. Between these two floors there should be a layer of heavy asbestos paper, incombustible felt, gypsum board, or other incombustible material, to deaden sound, make the floor warmer, and resist the passage of fire through the floor.

A hardwood floor should be tongued and grooved, that is, have a projecting rib on one edge and one end and a corresponding depression on the other edge and the other end, so that the boards interlock. They should be driven firmly into place and blind nailed, that is, after one strip of flooring has been wedged up against the strip already secured it should be nailed to the under flooring through the edge, which in turn will be covered by the next strip of flooring to be laid. Either in placing the floor board or in driving the nails, a hammer should never hit any corner or surface of the board which is to be left exposed. A wooden wedge should be used to drive the board into place and, in order to prevent scars, an iron "set" should be used for the last blows of the hammer which bury the head of the nail. It will prove to be an economy to have the floor laid by a special floor-layer rather than by a carpenter.

After the floor is laid it should be scraped by hand or by machine to ensure that all unevenness is removed; it should then be sandpapered and polished. The waxing or staining is discussed in the chapter on Painting.

Thresholds. — These may be either flush or raised, and are of wood except when the finished floor on one side is of granolithic, tiles, or other masonry. In that case the threshold is usually of slate or marble. A raised threshold beveled at each side allows the doors to close tightly, and when opened, to swing clear of rugs or carpets. It is recommended that the floors of closets be laid level with the top of the threshold rather than with the floor of the room, as this allows easy cleaning.

### PLASTERING

PLASTERED walls and ceilings are in almost every home, and any defects in them are always conspicuous. An uneven ceiling catches the light, a crack in the wall splits the paper, and even the little scars from pitting will spoil a painted surface. Proper construction, good materials, and skillful workmanship are needed for fine results, and the greatest of these is proper construction; for, while unskilled workmanship may result in "popping," or the dropping of small particles from the plaster, or glaze cracks, an uneven surface, or other defects, the more serious results of the cracking and the falling of plaster are due to improper framing and the use of too small timbers. These are fundamentals which cannot be changed after the house is erected.

#### **BASIS**

Plaster may be applied directly on masonry, on wood laths, on metal lathing, or on gypsum plaster board.

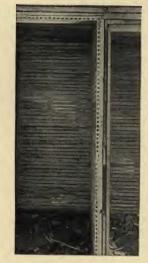
On masonry. — In the majority of residences there are few interior partitions of brick or hollow blocks, and it is unwise in cold or wet climates to plaster on the masonry of exterior walls, lest the dampness penetrate and ruin the plaster and painting. Even if the dampness does not penetrate, there is danger of condensation due to the difference of temperature

between the air inside and outside. Plastering on masonry, however, is the cheapest method, as one less coat is needed and as there is no expense for lathing. In order to provide an air space next to masonry, furring is applied, which may consist of long wooden strips about 2" x 3/4", nailed vertically on the wall 12" or 16" apart and trimmed to give an even nailing-surface for the lathing; or of an incombustible material, such as hollow tile or gypsum furring-blocks or metal. Since furring provides an air space that lessens heat-conductivity, a saving in fuel may be effected which may more than repay the added cost of furring.

On wood laths. — Whether on furring strips or on partition studs or on ceiling joists, the cheapest laths are of wood. For this purpose pine, spruce, hemlock, and fir are commonly used. They should be straight-grained, well seasoned if possible, free from loose knots and — to prevent subsequent discolora-

tion of the plaster—free from resinous knots or pockets. This last is especially important. The laths should be spaced about 1/4" apart, to allow the moist plaster of the first coat to be pressed through so as to harden in the form of a clinch or key at the back. They should be nailed at every stud and preferably double-nailed at their ends.

The ends of the laths should not lap, but be butt-joined and flush at the studs or furring-strips. A continuous row of joints



Corner Bead

On the exposed corner is a V-shaped strip of metal with blunted point to serve as guide for the plasterer and protection to the plaster. The sides are perforated to give a key or clinch

on one support should not be allowed for more than 18", as a precaution against cracking the plaster; in other words, the laths should be applied in panels, with the ends of one panel one or two feet away from the ends of the adjoining group.

The nails best suited for wood laths are cut, about 1 1/8" long



Rough Coat

The scratches on this under coat of plaster allow the next coat to adhere more firmly. Ordinary wood lathing is shown in the hallway beyond

with large flat heads; they should be galvanized to prevent rusting and so discoloring the finished plaster.

On projecting corners there should be metal corner-beads or long strips of galvanized iron bent to form a right angle with a rounded corner. These are nailed to the support for the lathing and carefully trued up with sufficient projection to align with the face of the finished plaster. They serve not only as a guide for the workmen but as a protection to the corner from being chipped or dented, and should be omitted only when a special effect of hand modeling is desired on an exposed plaster wall.

On metal lathing. — The various forms of wire lathing and expanded metal cost a little more than wood laths, but they are fire-resisting; they give a better clinch for the mortar and a support on which the plaster is less liable to crack. Metal lathing is especially recommended for use on the wood framing of ceilings of basement and boiler rooms, as it is a positive flame-retardant. It makes the rooms above dryer and cleaner, as it is less liable to let the plaster crack. It is also recommended by the Government for use on party walls in two-family dwellings, and for floors and ceilings in the garage, as a base for Portland cement or gypsum plaster.

On gypsum plaster boards. — These are sheets of gypsum plaster coated with paper, wood, or other vegetable fibre, finished so as to provide a proper base for the plaster. A common size for small dwellings is 32" x 36" and ½" thick. It is recommended that each board be nailed to three supports and that perpendicular joints be broken. Being made of gypsum, these boards have fire-resisting qualities.



### Ornamental Plaster

The hand-modeled quality of the mouldings on this ceiling harmonizes them with the low-relief flowers and figures. Even the smooth background itself has a slightly uneven surface. James O'Connor, Architect

#### **MATERIALS**

Plaster is usually prepared on the job, but in some localities ready mixed plasters can be obtained, which are satisfactory if of a good quality. They are especially adapted for winter use when unfrozen sand is hard to obtain.

Plasters are divided into lime plasters and gypsum plasters. The former, as the name implies, are made of lime, the latter, commonly called hard plaster, of gypsum (plaster of Paris). In their mixing the following ingredients are used:—

Lime. — Lime, or as it is more exactly called, quicklime, is derived from limestone. Combined with water, a process takes place which is known as slaking, resulting in lime putty if there is an excess of water, or in hydrated lime, — a flourlike powder, - if there is just enough water to complete the chemical reaction. The making of lime paste from quicklime is a process that requires great care. First enough water is added to bring it to the consistency of cream. This should be passed through a screen of about 10 meshes to the inch, to remove any unburned limestone. It should then settle for two or three weeks, when the excess water may be drained off, leaving a putty ready for use. If the original lime is of poor quality, or if it is not properly slaked, it may contain minute hard nodules impervious to the immediate action of the water; which, if allowed in the last coat of plaster, in time will disintegrate or "pop," and pit the surface even if heavily painted. If a wall starts popping, the chemical reaction may continue more than a year, when it finally stops. If there are only a few craters they may be touched up, but in aggravated cases the whole wall or ceiling must be done over.

Sand. — As lime shrinks when setting, sand is mixed with it to give it increased strength. The sand used must be clean and sharp. If a sand-finish plaster is wanted, sand is used in the skim coat.

Hair. — Either cattle or goat hair, mixed with the lime putty, is used with the first rough coats of plaster as a binder. It should be free from grease and well combed or beaten to prevent matted lumps.

Gypsum. — Gypsum is a natural mineral, composed principally of calcium sulphate crystallized with a definite amount of water. When heated to a given degree, three quarters of the water is driven off, leaving a residue which, when ground to a fine powder, is known as calcined gypsum or plaster of Paris. This, when mixed again with water, recrystallizes or "sets" in the form of the original gypsum. As pure calcined gypsum sets very rapidly, hydrated lime is frequently mixed with it to retard its setting and to give it greater plasticity.

Keene's cement. — When gypsum is calcined at over 400° centigrade, a material is formed which has no power to set unless certain compounds are added to it. When combined with alum, the result is Keene's cement. This makes a hard plaster, one that sets more slowly than calcined gypsum; but the ultimate product is the same — gypsum. This material, often marked off in tile patterns, is practical for use as a cheaper substitute for tile in bathrooms or kitchens.

#### APPLICATION

Walls usually have three successive layers of plaster, known as three-coat work. In many parts of the country, however, it



Painted Plaster Wall

The broad surfaces of this wall make an excellent background for the mellowed furniture and gayly colored chintz. John F. Staub, Architect

is customary to use only two coats, which are sufficient if rigidity is not important. These coats may be either the scratch and brown — when the brown coat is floated to a sand finish, left natural color, or painted — or scratch and finish. For three-coat work the process is as follows:—

First coat. — The essential requirement for the first coat is strength. Lime plaster is sufficiently strong for ordinary purposes, but gypsum may be used when unusual hardness is required. With lime more sand is used than with gypsum, a common proportion being one part hydrated lime or lime putty to three-and-one-half parts sand; or one part gypsum to two parts sand. The material should be allowed to stand several days to ensure time for chemical or physical action. In consistency it should be stiff enough to fold over the edge of a trowel without breaking off. This coat should be fully ¼" thick, and when nearly dry should be scratched over, to form a clinch for the work to follow.

Second coat. — In the case of the second coat, plasticity is more important than strength. It is therefore permissible to add a greater proportion of sand, which will reduce cost and

### PLASTERING

increase sound absorption. One part lime to four parts sand, or one part calcined gypsum to three parts sand, is a safe rule. A two-handled wooden derby about three feet long is used to true up the moist plaster, which is then smoothed and compacted with a wooden float.

Third coat. — The third (finishing or skim) coat consists usually of lime putty and calcined gypsum, the former giving it plasticity and the latter a smooth hard finish. As this coat hardens rapidly, it should not be applied till the second coat is quite dry, so as to avoid unequal shrinkage and resultant hair cracks or crazing in the finish coat.

Other finishes, apart from the conventional smooth, glossy white one, are similar to those given to Stucco, as described in Chapter VIII and in the *House Beautiful Furnishing Annual*. For interiors the texture should be finer, smoother, and on a smaller scale than for exterior walls. If the wall is to be painted with an oil paint, it is important that the plaster be thoroughly dry before the paint is applied.

The plastering of ceilings is in general similar to that of walls, but it is best to use furring strips at right angles to the rafters instead of placing the laths against the framing itself. The second or brown coat may be omitted, as it is well to reduce the weight of material on the ceiling.

### MOULDINGS

Mouldings of plaster which do not project more than an inch or so are built up solid before the finished coat is applied; but for cornices which project farther a "cradling" or form of

brackets and laths is built out to the general profile desired and then rough-plastered.

Simple mouldings are run: that is, a sheet-metal mould with a wooden back and having the exact silhouette desired is passed back and forth over the soft gauge-plaster of the last coat, the exact projection being maintained by wooden guide-strips.

Ornamental mouldings are cast according to architects' designs; but these are very expensive. Stock patterns and low-relief ornament can be purchased from several large concerns which specialize in this type of work. These too are further described in the *House Beautiful Furnishing Annual*.

#### PLASTER SUBSTITUTES

The high cost of plastering and a desire to hasten construction have helped to create a demand for materials to replace plaster, which has resulted in the production of plaster substitutes. With several of these an effect closely resembling a plaster finish can be obtained; indeed, a great variety of textures and colors are possible which can be adapted to almost any style of architecture. One of the advantages of these materials is that they can be applied with a brush by a painter either on old plaster, on new plaster for a special finish, or directly on the many wall boards on the market, so, in the latter case, producing walls that have all the appearance of being plastered but which are obtained entirely without the help of the plasterer. Such walls are permanent, and moreover they can be washed without injury to the surface.



Simple Plaster Ornament

An admirable use of simple plaster ornament is seen in this dining-room, where decorative bands mark off the ceiling in large panels.

W. Stanwood Phillips, Architect

### XIII

### GLAZING

THE eyes of a house are the windows, and their size and enframement and the number and proportion of the separate lights or panes of glass in them are all part and parcel of the expression given the façade. But the artistic side, fascinating as it is, cannot be covered here; it must be only touched upon from the dryly practical angle.

#### **MATERIALS**

To familiarize the prospective home-builder with trade names and usages the simplest classification is, first, that of transparent, and, second, translucent.

Transparent. — Transparent or clear glass ranges from plate to common. The first is the thicker, the freer from flaws, and the more costly; the other is thin and wavy but inexpensive.

PLATE GLASS. — This is rolled, not blown, during fabrication and then buffed and polished. In standard products it ranges from  $\frac{1}{4}$ " to  $\frac{5}{16}$ " in thickness, and sheets can be obtained for the largest windows.

DOUBLE-THICK AA GLASS. — This can be obtained in weights

and quality which for the inexpensive house may be used instead of plate glass, at a considerable saving in cost. The designation "AA" is a common trade name for the best stock. "A" grade may have slight waves, hardly noticeable in the individual sheet until set in place.

single thick or common glass. — This grade is suitable for small panes where strength and perfect vision are not required. Per square foot, the cost would be about one sixth that of plate glass.

Translucent. — Translucent glass includes stained or painted, used for decorative purposes, and the so-called obscure glass used in toilet-rooms and the service parts of the home. Under the latter classification come: —

GROUND GLASS. — This term is used where one face is sand-blasted for a white, frosted effect.

moulded into small ribs or ridges, either straight or curved in pattern, which so break up the vision that only confused outlines can be seen through it.

CATHEDRAL GLASS. - This has an attractive, irregular,



Bringing the Outdoors In

It is very essential that windows be well placed, large, and of clear unblemished glass when there is such a view as this to be gained.

Willing, Sims & Talbutt, Architects



Stained Glass

In this room of varied color the exquisite medallions of stained glass and fantastically leaded panes add to its richness. John Mead Howells, Architect

(supposedly) antique surface; but the alternative of name "hammered" better describes its slight indentations. Of course it was rolled, not hammered, and probably it was never used in a cathedral; but the names are suggestive and have stuck. This glass at present has a certain vogue for Colonial or Elizabethan houses. It comes in white or in soft shades of green, blue, and mauve.

WIRE GLASS. — A valuable modification of glazing which is used in either transparent or translucent lights is wire glass. Strong woven-wire netting with strands about half an inch apart is imbedded in the molten glass, which must be thick enough to cover it on both sides. It is used in the windows on dumb-waiter shafts and coal-chutes, in the doors of garages, and wherever special precautions are required.

#### SETTING

Wood Sash. — In wood sash the glass is cut to fit loosely into the angle around the opening and then is bedded in putty and held in place by small flat metal points. Putty is next pressed into each corner, filling it up to the line of the woodwork, and is smoothed off and painted. Unless otherwise specified, glazing is done with uncolored putty. Only putty made with linseed oil should be used.

Metal Sash. — In metal sash the glass is bedded in putty and then locked in place with strips of metal.

Leaded Glass. — In leaded glass putty is not used, the soft lead strips being pressed close against each side of the glass. The term "leaded" refers to the setting rather than to the glass itself, which may be clear or stained and with or without a special texture, according to the artistic effect desired.

The lead compound is made in narrow, flexible, H-shaped strips which hold the small segments of glass in a decorative mosaic and in themselves form a brilliant pattern. In late Colonial times the fixed sash at the sides of front doors and above them was often leaded, with wider metal than in Tudor or Elizabethan windows, and it often had cast rosettes at the junction of the lines in the geometric designs and little bas-relief lead eagles or baskets of flowers at the centre of a fanlight or arched transom.

Glass is an artistic medium of the first rank, and as such deserves expert attention. The crude stained-glass windows in many of the mansard-roof mansions of the 'eighties prove how dreadful glass can be when wrongly used; on the other hand, the charm of many colored windows has outlasted the ages. To-day glass enters into domestic construction more fully than ever before and will be more and more used.

The glass manufacturers usually have experts on their staffs who can advise adequately on any special glass-problems confronting the home-owner.



Leaded Fanlight

In this doorway of classic proportions and paneling the leaded fanlight of eagle design is well used. Eleanor Raymond, of Frost & Raymond, Architect



A Hospitable Hall

No matter how beautiful the house may be architecturally or how attractively it may be furnished, unless the woodwork is well painted and the floors given a well-polished and wear-resisting finish, something is lacking. Dennison & Hirons, Architects

# PAINTING AND VARNISHING

Many forms of paints and varnishes are available for covering the interior and exterior materials of the house. They serve a double purpose, decoration and protection; and although the first is the one generally considered by the public, the second is by far the more important. The thin coating, almost microscopic in thickness, may have an infinite variety of color and many textures; but it is this continuous film, filling the pores of the wood or masonry or completely encasing the metal-work, which prevents decomposition and disintegration of the materials, caused by the weather and minute fungi. Moreover, a well-painted surface is a sanitary surface, as it affords no hiding place for bacteria and is easily cleaned.

#### **PAINT**

Paint may be roughly defined as a mixture of solid and liquid that gives an opaque coating. The solid is the pigment; the liquid is called the vehicle. This hard smooth coating, in the case of oil paints and varnishes, is due to the presence in the paint of some kind of drying-oil, the most important of which is linseed oil. The mixing of paint requires great skill; the amateur painter, therefore, had better depend upon materials that are ready mixed; but these can be varied in color, if desired, by the addition of paints in paste form.

Ingredients. — The materials used in making paint are so many that only the most important will be considered here.

WATER. - Water is sometimes present in small amounts in oil paints, but it is only in cold-water paints and calcimine

that it plays any real part.

LINSEED OIL. — This oil, the most important of the drying oils, is made from the seed of the flax plant. It is handled commercially as raw and boiled. The term "boiled," as applied to linseed oil is a misnomer, for the liquid is not boiled, but heated somewhat below the point at which it would decompose, and oxides of lead and manganese are combined with it to form what is known as a "drier." As far as practical results go, there is very little difference between the use of boiled linseed oil and raw linseed oil to which a certain amount of drier has been added, even without heating.

THINNERS. - Thinners are used to hasten the drying of paint and to give it a flat, lustreless surface, but should not be used to any great extent on exterior work, except in the under coats. Used in the first coat, a thinner will assist the paint in filling the pores of the wood. The material commonly used for this purpose is turpentine, a volatile liquid produced by distilling the resin of pine trees. It has pronounced solvent and evaporating characteristics, but it is somewhat expensive compared to benzine, naphtha, or "petroleum spirit," which may sometimes be successfully substituted for it.

PIGMENTS. — There is a limitless range of pigments which are obtained from minerals by chemical processes, of which white lead and zinc oxide are the most important, or from organic sources - such as carmine, which is produced from the cochineal insect, or Dutch pink, produced from the bark of quercitron, and, more recently still, the brilliant coal-tar

products, some of which are unstable.

A good pigment should have the following characteristics: it should consist of finely divided particles; it should possess hiding-power in the vehicle in which it is used; it should form, as nearly as possible, an opaque coating; and it should have

no injurious action on the surface to which it is applied. There are many colored substances that have good hidingpower, but white lead, zinc oxide, and lithopone are the only white pigments that have this property. Of these white lead is the most important and is the only one that can be used alone in white linseed-oil paints for exterior painting. Pure white paint, however, is the most expensive paint for exterior work, as more is needed to "cover," and it is the least durable. By a very slight tinting its durability can be increased 50%. White-lead linseed-oil paints decay by chalking, a condition satisfactory for repainting. White zinc-oxide linseed-oil paints are liable to crack. The latter should, therefore, have other pigments mixed with them. Zinc oxide is used alone, however, in the best grades of enamel paint.

Paints may be divided into oil paints and cold-water paints.

Oil Paints. — The principal ingredients of oil paints have already been given. Oil paints are used almost entirely for permanent work, both outside and inside the house. Special effects and special uses have developed the following names:

ENAMEL PAINT. - This is similar to lead-and-oil paints, except that in place of the oil a varnish vehicle is used, to give the enamel an extremely glossy and smooth surface.

WALL PAINT. - A demand for an inexpensive interior paint to be used on plaster and woodwork, that can be washed, has produced a special paint that is composed largely of lithopone, combined usually with a light mineral oil and a rosin China-wood oil varnish.

RED-LEAD PAINT. —This is used only for protecting iron and steel, and is one of the best paints for this purpose.

ALUMINUM PAINT. - This paint contains metal-powder pigments, combined with linseed oil or spar varnish or both. It is prepared especially as a protective coating for metal, wood, or concrete, and is familiar to the householder as the material usually employed for covering radiators. Recent experiments have shown that this paint retards the radiation of heat and therefore is not the best for this purpose. A radiator covered with aluminum paint was found to be from 15 to 20% less effective than one treated with a non-metallic paint. A first coat of aluminum paint, however, if covered with an oil paint, will not diminish the heat radiated, as it is the surface-coat that counts. This property of aluminum paint, on the other hand, makes it desirable as a covering for the furnace and heating pipes if an insulating material is not used, and it will, if applied to the under side of a thin metal roof, reduce the heat radiated by 50%.

Cold-Water Paints. - Calcimines, or cold-water paints, as they are commonly referred to in the market, are powders made from whiting or from various clays and silicates, which are mixed with glue or casein to ensure their adhesion. The powder should be kept dry till ready for use and then mixed to the proper consistency with water — preferably warm, despite the name of "cold-water" paint. They come in various tints and colors, which can be intermixed to the shade desired, but the light shades are the most attractive. They are used for tinting plaster and wallboards.

WHITEWASH. — This is the cheapest wall-covering, and as

its base is lime, it is sanitary and well adapted for cellars, barns, and the like. Ordinary whitewash is made by mixing lime with water to form a smooth thick liquid, five pounds to the gallon giving good results. Many ingredients may be

added to increase adhesion and durability, such as salt, flour

paste, glue, alum, soap, and so on.

Both calcimines and whitewash may be tinted by the addition of *pigments which are not affected by lime*, such as yellow ochre, siennas, umbers, iron-oxide, ultramarine blue, and boneblack.

#### **VARNISHES**

Varnish may be defined as a liquid not containing pigment, used for protection or decoration, and capable of being spread in a thin, homogeneous film which will dry to a hard coating. There are spirit varnishes and oil varnishes.

Spirit Varnishes. — These are solutions of resinous substances in a volatile solvent, usually turpentine, or in the case of shellac varnish, alcohol. Both shellac varnish and lacquer are classed as spirit varnishes. Lacquer differs principally in being thinner than shellac, and often in having soluble coloring matter.

Oil Varnishes. — Oil varnishes contain, in addition to resin substances and turpentine, an oil — usually linseed oil. These varnishes are the more numerous and common, and contain such well-known types as spar varnish, interior varnish, and floor varnish.

Shellac dries more quickly than an oil varnish and is, therefore, used for a quick-drying coat on floors and furniture. It is also used as a first coating on wood to fill pores and cover resinous knots. It is not waterproof and does not resist weather as does a good oil varnish, therefore it is not suitable for out-of-door work.

Oil varnishes have more body than spirit varnishes and consequently have better wearing-qualities. They are used especially where rubbing is to be done. A good varnish should be clear and transparent; it should set in not more than four or five hours and harden in not more than twenty-four hours; when dry, it should withstand cold water for eighteen hours and boiling water for fifteen minutes without whitening or dulling.

### WOOD STAINS

Wood is stained to change its color or to bring out its texture and grain, or, as in the case of shingles, for preservation. Stains may be classified as follows:—

Oil Stains. — The simplest form of stain is made from oils with a slight addition of coloring matter. The texture of a surface which has been stained may be greatly enhanced by waxing. Sometimes wood floors which are to receive hard usage, and interior trim which is left with the effect of weathered natural wood, are oiled. On floors a heavy coat of cold boiled linseed oil - or specially prepared oil for this purpose — is used, which preserves the wood, but darkens it considerably. An oak floor that has been especially treated with oil, after it is once saturated, - which means frequent oiling the first few months, - should need no further attention. Oil on interior trim, to give the antique finish, should be applied very lightly. Finely ground oil-pigments can be applied with the oil on interior trim and then wiped off. The pigments adhere to the more porous fibres, and because of the veining, give an interesting pattern. As oil stains do not penetrate very deeply into the wood, ammonia may be added to increase penetration. On oak it has much the same effect as

Water and Spirit Stains. — These are solutions of dyes in water or in alcohol. They are clear, penetrate deeply into the wood, and do not obscure the grain as do oil stains; but they have a tendency to raise the grain of the wood and they are not preservative. Water stains made from aniline colors are

likely to fade, although the addition of vinegar is said to prevent this.

Varnish Stains. — These have a vehicle of thin varnish and a small amount of pigment.

Acid Stains. — These burn some of the fibres in the wood, bringing out beautiful silver-gray tints in such woods as pine and cypress.

Shingle Stains. — These are intended to color and to preserve shingles. For this latter purpose they generally contain creosote oil, which has strong preservative properties. For the best results the shingles should be dipped in the stain and then stood in a trough to let the surplus liquid drain off. If stain is merely applied with a brush after the shingles are laid, it means that the parts covered by the course above and the under sides are not coated, and so the wood is not so well protected against decay. The dipping is the more expensive method but is well worth the extra labor.

### APPLICATION OF PAINT

There are several general principles with regard to the application of paint, whether it is used on the exterior or the interior of the house. Of prime importance is the necessity of having all surfaces to be painted clean and dry and free from grease. A first or priming coat must fill all the pores of the wood and furnish a foundation for subsequent coats. Then, after priming, all nail holes and cracks should be well filled with putty. Before a new coat is added the last coat must be thoroughly dried out. To furnish a good foundation it should dry flat.

Exterior painting should be done in clear, moderately warm weather. Many thin coats give better results than a few heavy ones, but mean, of course, greater expense. On new work, however, three coats should be considered the minimum for oil paint, and four are desirable for outside trim, such as columns or balusters. For repainting, when the surface is satisfactory, two coats are sufficient. At least two or three days should be allowed for one coat to dry before the next is applied.

Boards with resinous knots will stain through paint unless the knots are first shellacked. If a house might stand six months or even a year before painting, the resins in the wood, by this exposure, would come to the surface and either harden or be washed away. The house would then be in a better

condition for painting than when new.

As paint on the interior of a house is protected from the weather, it may be expected to last longer, although bright colors will fade and white paint containing a large amount of linseed oil will turn yellow. More drier is used on the interior, to ensure more rapid drying, and a little varnish may take the place of linseed oil in the last coat, as a binder and also to give a higher gloss. A finer surface will be obtained if each coat is rubbed with sandpaper or steel wool. For an eggshell finish the final coat should be rubbed with powdered pumice and water and a piece of felt; for a velvety finish it should be rubbed with rottenstone moistened with olive oil; and for a bigh gloss, with a chamois skin and no abrasive.

Old plaster walls, especially in kitchens, are liable to be greasy; they should be washed with soap and water with a little ammonia added, and rinsed before paint is applied. If the wall has been patched in small places with plaster of Paris, these spots should have several preliminary coats before the whole surface is covered. New plaster is usually sized before painting. In this case only one coat of calcimine is necessary. But if to be painted with wall paint, two coats should be used, and if a gloss finish is desired, a third coat should be added. It is extremely important that plaster be thoroughly dry before it is painted, and it is advisable, in the

#### PAINTING AND VARNISHING

case of plaster less than a year old, to apply a wash of three to four pounds of crystallized zinc-sulphate to a gallon of water, to remove any remaining free lime.

#### APPLICATION OF VARNISH AND SHELLAC

Varnish. — Varnish should be applied in thin coats, with each coat allowed ample time to dry and then rubbed to a dull finish before the new coat is added. It is important that varnishing be done in a room that is free from dust. Open grained woods such as oak, chestnut, and ash, used for interior work, should be treated with a filler before varnishing. Paste fillers, which are commonly used, are practically colorless but may have stain added to them if desired. The first coat of varnish may be applied a day or two after the filler. This should then be allowed to dry from five to ten days, unless a quick-drying, rubbing varnish is used, when the time can be lessened by one to three days. It should be rubbed with curled hair or excelsior. The second coat is then applied and treated similarly, or rubbed with fine sandpaper or glass paper. For a first-class job with gloss finish, rub the next-tolast coat with pumice and water. For best results on interior woodwork there should be four coats.

For exterior woodwork no filler is used, and the coats—except the last—are lightly sandpapered. The last coat is left with the natural gloss.

Shellac. — Shellac is often used for interior finish, especially when it is desirable to retain the natural color of the

wood. It should not be used for exterior work, nor near heat, as it will blister. It should be applied in thin coats, with six hours between the first two coats and then a two-days interval between successive coats. From eight to twelve coats are required for a first-class effect, with every third or fourth coat rubbed.

#### QUALITY OF MATERIALS

In the purchase of paints and varnishes the householder will find it extremely difficult to determine whether the ingredients are up to the standard specified. Some manufacturers advertise their products as meeting the Government Bureau of Standards specifications. It is well to call for the materials to be delivered at the job in the original sealed containers; but the owner should endeavor to secure a painter upon whose knowledge and honesty he can rely, and in purchasing the materials he should consider the established reputation of the manufacturer or rely on a dealer whom he knows.

The difference in cost between excellent and poor paints is negligible as compared to the total cost of the materials and the labor to apply them. This small saving, however, will make a conspicuous difference in the appearance of the house and may seriously interfere with its preservation.

The owner should have the painter make up samples of the paints and stains "on the job," for the results will be a better guide than the manufacturer's samples made in the laboratory.



Transformed by Paint

This basement dining-room, which once was a dreary cellar, has been made into a bright cheerful room by a generous use of paint. A floor of mustard color concrete and walls of soft yellow make an excellent setting for the brownish gray beams, the maple furniture, and the yellow chairs and dresser. Putnam & Cox, Architects

#### HARDWARE

THE hardware built into a house is divided into rough and finished according to the trade names. The first is hidden when the work is completed, but the second is an important element in shaping the character of the final result.

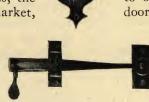
Rough hardware, although important, need concern the house-owner little, if he has a competent architect or a reliable contractor. It includes nails and screws, hangers for supporting the ends of joists, window weights and the like.

Finished hardware plays an important and intimate part in the comfort and safety of the family and, owing to the diversity of materials and finishes, the many uses, and the ingenious models on the market,

deserves special consideration by the homebuilder. It will be discussed under the following headings: for doors, double-hung windows, casement windows, drawers and cupboards, coat hooks, blinds and shutters, garage.

There is no fixed line between finished hardware and house furnishings. Door-knockers, fire-iron hooks which screw into the wall, foot-scrapers, name plates and numbers for the front door, all might belong in either class, depending more on the owner's taste for decoration than on utilitarian needs. A rough guide to an

estimate of the cost of finished hardware in a house is two per cent of the cost of the house itself.



Thumb Latch

Wrought-iron thumblatch handle of the early American type and drop latch to go with it

FOR DOORS

Door latches. — The latch was the original form of fastening for keeping the door closed, and in the primitive types a string extended through the door and hung down on the

outside for the purpose of lifting the catch. The old hospitable phrase, "leave the latchstring out," meant that when

the string was out a visitor was free to enter, whereas, if the string was pulled in, the door was locked.

Door latches of metal, in simple types of wrought iron and brass, are much in demand. They are easily applied, indestructible, and not expensive. On outside doors the fixed handle with a movable thumbpiece in place of the knob is often used for decorative effect, even though a compact cylindrical lock is added for security. In houses which are following the Colonial style to the last detail, iron latches are often



placed even on the bedroom doors. Interest in early American furnishings of all types has naturally extended to such details of hardware, which have accordingly become readily available in designs inspired by early precedent.

The word "latch" to-day commonly refers to the catch in the edge of the door, which fits into a socket in the door frame and is operated by the turning of a knob, rather than to the pivoted latch referred to above, which lifts up and down. For interior doors this is usually of very simple construction. For exterior doors the mechanism is more complicated and heavier, to obtain security. The addition in the edge of the door of the "spring catch," consisting of two small push-buttons or a little lever which can be

push-buttons or a little lever which can be thrust up or down, locks or disengages the latch itself, and governs the operation of the outside door-knob while the inner handle still has full control. The latch itself (or the socket into which it engages) is so formed that when the door is closed the latch cannot be released by inserting a knife from the outside.

Door locks. — In general, these may be classified as the tumbler type, with the old-fashioned key and large keyhole, and the cylinder type, having a small flat key with a

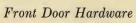
corrugated edge, so grooved that it fits a slot in the face of the

THE TUMBLER LOCK. — This may be single or triple. The first is satisfactory for a bedroom door, but can be easily picked with a hairpin. A high-grade three-tumbler lock is more burglar-proof and somewhat more expensive.

THE CYLINDER LOCK. — This, although more expensive still, gives by far the greatest protection, and does away with the

old-fashioned cumbersome key. Cylinder locks are adapted for outside entrances especially, as they require a thicker door than the single-tumbler style.

Door knobs. — These may be of many sizes, shapes, and materials. For interior work the smaller circular models are the least expensive. They are mechanically satisfactory and are in better scale in the small house. Oval or octagonal models, however, have greater individuality. For the service parts of the house they may be of white crockery, enameled composition, or lacquered iron. For the owner's



At the left, a handle of brass or iron of old Salem type. The escutcheon over it is a cover for a modern lock but it has the feeling of the old. Above is a door knocker of brass of similar type and associated with the handle just described. At the right is shown the interior hardware for a handle similar to the one on the left. With this combination the effect of old period hardware can be obtained with the convenience of a modern lock and key. Courtesy of W. C. Vaughan Company



#### HARDWARE

#### Knobs and Handles

Below in order beginning with the upper left are: a glass knob with Colonial keyplate, a small round knob in brass or bronze, an oval knob of Adam design, a plain oval knob, and a lever handle for French door. The first three are Corbin products, the next Yale, and the last that of Sargent & Company



Old French Hardware

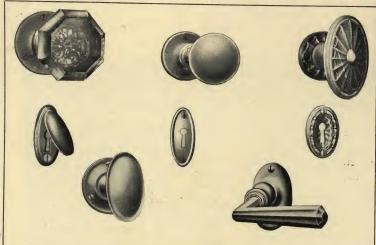
A wrought-iron latch with a knob of dull brass. A type used extensively with early period houses. Courtesy of W. C. Vaughan Company

portion they may be iron painted a dull black or left unfinished. They may be

in spun or plated brass or cast brass or bronze (the spun or plated being the cheaper, while the solid metal is the more lasting), or they may be silver-plated or of glass. In the average modern house, glass knobs are the most popular and attractive.

A lever bandle should be used instead of a knob on the narrow woodwork of French doors to prevent the fingers from being jammed.

The hardware for the outside doors should be of the best quality that can be afforded. It receives hard usage, is exposed to the weather, and gives character to the building.





Wrought-Iron Handles

These fifteenth and sixteenth century designs of Italian and English types are appropriate for houses of that period. Courtesy of W. C. Vaughan Company

Escutcheons.—The metal plate which covers the keyhole is called the

escutcheon. When this plate is enlarged to surround also the socket for the knob it is called an elongated escutcheon. This may vary from a flimsy sheet of thin metal beveled at the edges to a heavy plate with elaborate ornamentation. Those of excessively light weight, although very cheap, are unsatisfactory in that they are liable to warp, dent, and deteriorate; but, on the other hand, decoration is by no means essential—in fact, the highly ornamented types are like any exaggerated fashion which may be in style for a short period but which eventually may become absurd. Simplicity and solidity, regard to the scale (or proportion)





Decorative Hardware

At the left, the knocker and small knob of brass, the blind-fasteners, and the foot-scrapers are all well used, as is the Colonial hardware of wrought iron on the door and shutters on the right. David Adler and B. V. White, respectively, are the architects

#### THE HOUSE BEAUTIFUL BUILDING ANNUAL

of the hardware to the rest of the house, and a finish which in texture and color harmonizes with the style of the architecture, are the standards which should be followed.

Bolts. — Often for interior or exterior doors small bolts are used. For these there are many styles from which to select. For double and Dutch doors, bolts are necessary to hold one half in place while the other half has the ordinary latch and lock. The simplest and most economical form for this purpose is the small bolt sunk in the edge of the door — one at the top and one at the bottom. This, however, usually means broken finger-nails and awkward operation. Especially on French windows, or on double doors

which are glazed and have a comparatively light wooden framework, the most convenient

Long Bolt

Edito?

A bolt for French door that extends the full length. Courtesy of The Yale & Towne Manufacturing Company form is a long bolt with a shaft extending the full height of the door, operated by a handle in the middle. The shaft and sockets for the bolt-heads may be painted to match the woodwork.

Hinges or Butts. — For light interior doors these may be

of painted iron; but those bronze-plated are better, and the cast bronze or brass are best, although considerably more expensive. For interior doors two butts are sufficient; but for large, heavy doors three are preferable. In monumental work, ball-bearing hinges are often required, but in most houses they are not needed.

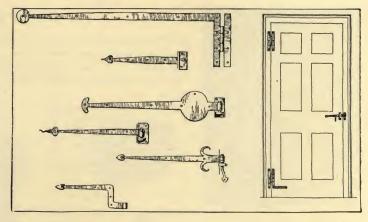
T, H, AND H & L HINGES. — These are the trade names for the old-fashioned hardware in which the two leaves of the butts are attached to the face of the door and to the door

frame, and often extend out some distance along the stiles and rails of the door. These are usually painted black against the stained or white door, or may effectively be left unfinished, to show more distinctly the hand-forging. For such hardware the door should be flush with the trim. Hand-wrought ironwork which is well made has a very attractive texture through the hammer-marks that must show on its surface.

PIVOT HINGES. — These are used in residences in double-swing pantry doors. The entire mechanism is set below the floor, with a heavy pin engaging in a socket in the under side of the door. This form prevents the flapping and pounding that sometimes occur in the less expensive double-acting-spring hinge.

#### FOR DOUBLE-HUNG WINDOWS

Catches or fasteners.—The catches or fasteners which hold the upper and lower sash



Colonial Hardware

 ${\it H}$  and  ${\it L}$  hinges and other types of early American hardware of wrought iron

together should be of cast bronze or brass. They should be of such a form that they exert a leverage to pull the two sashes firmly together, and also prevent their being easily opened from the outside by the insertion of a thin knife. Their size and weight are determined by the thickness of the woodwork of the window, and by the amount of money that can be allowed for them.

Pulleys. — The pulleys over which the window cords run are inconspicuous but important features. A pulley which is too cheap will get out of order or rust, and bronze face plates are an excellent safeguard. The so-called Pullman sash-lifts or compact steel springs are used when there is not sufficient space in the frame for window weights. The pulleys or sash lifts are usually specified separately from the finished hardware.

#### FOR CASEMENT WINDOWS

On casement windows which are usually designed to open out, since they are in that way more easily made waterproof — the hardware should be of brass or of galvanized iron. The windows are held open at different angles by casement adjusters, and are locked by casement fasteners. They may be screened by hinged screens swinging in a direction opposite to that of the casement, or by rolling screens so installed as to roll up out of sight at the top of the window when not in use. Rolling screens are usually more satisfactory with narrow casements than with wide ones.

#### FOR DRAWERS AND CUPBOARDS

For the pantry, kitchen cupboards, and linen closet the simple and solid forms of catches, pulls, locks, and handles are the best; the difference in cost between the different models and finishes



Adam Period Hardware

Above is shown a miscellaneous group of knobs, handles, escutcheons, all appropriate for rooms in the Adam style. Courtesy of The Yale & Towne Manufacturing Company

is comparatively insignificant. The smaller sizes are the most attractive. Where the wear is not great, wood knobs have a special charm. Hardware for such purposes may be obtained in the design of any period that is being emphasized in the other furnishings.

#### COAT HOOKS

Coat hooks range from rather fragile painted-iron ones, which are sufficient for the kitchen closets, up to the brass

or nickel-plated or whiteenameled models for the fronthall coatroom, or the guest bathroom. The two-prong design is the type of greatest utility, but special inverted models are made for fastening to the under side of cupboard shelves, and flat three-pronged models to go against a bathroom door, where the usual projection might get in the way.

#### FOR BLINDS AND SHUTTERS

More attention than formerly is now being paid the hardware for blinds and shutters.

The simple form of projecting notched iron spike, for holding open blinds and shutters against the side of the house, is liable to work loose from the wall or get out of place, making the catch work with difficulty. The more expensive, old-fashioned type of pivoted catch on the end of the projection from the wall is more secure, and a very decorative item, especially in the S or pigtail Colonial designs. These fasteners should be made of galvanized iron and heavily painted to prevent rusting. They hold the shutters securely, so the

wind cannot close them, and if the shutters are being featured, these holdbacks may take a positive part in the design. A much more expensive type of fastener is one which works through the wall by means of a rod and has a revolving handle on the interior side. This is expensive in itself and much more complicated to install; it is adopted only in the most luxurious residential work.

#### FOR THE GARAGE

Convenience and durability are the main characteristics to be sought in the hardware for most garages, although in a garage incorporated in a house, or placed elsewhere in a conspicuous position, a careful selection of hardware will often do much to make it attractive as well as serviceable. The door of a garage is usually designed according to the type of hardware chosen, whether it is a self-opening device which responds to the weight of the car, or one which hangs the door only from the top and provides an overhead tracking on which the door slides around to the side, to avoid clogging of snow and ice at the threshold, or an arrangement which lifts

the door up into the roof or ceiling of the garage. Many types are available, in new, ingenious methods or in the usual designs, which have been proved practical by years of service.

#### SELECTION OF HARDWARE

The owner with his architect — or with his builder if the latter is to serve as his only professional adviser — should visit one or more hardware dealers who have a generous display of samples, and select the standard types piece by piece, noting down the

stock numbers and comparing prices. He can then determine what amount he will allow for the purchase of the finished hardware for the new house. It is customary for a flat sum to be included in the estimating and contract specifications for the purchase of the hardware, together with a statement that its installation is not included in the allowance, but is part of the regular work of the contractor. This method has been found the most satisfactory, as with finished hardware the weight of metal, the type of the ma-terial, the design of the interior mechanism, and the quality of the finish would be difficult to specify in full detail without the use of samples, and it would require a great expenditure of time if each of the estimators had to obtain competitive bids.

Finishes. — The finishes on solid brass or bronze are bright, which is highly polished and a light color; old brass or salmon color, which looks as if it had been rubbed, and is covered with fine lines rather than an absolutely smooth, even surface; statuary bronze, which is a dark color and may be

either polished or rubbed. When steel hardware is plated with copper or bronze the finishes are similar to those described for the solid metal.

Painted iron or steel should have three coats of heavy lead and oil enamel. The color is usually black, or else the same as the woodwork. Unpainted hardware is ordinarily lacquered. Solid bronze and brass do not need lacquer, but are always so covered unless specially ordered; this is done to keep the finish bright until the hardware is installed in the building. The lacquer wears off with time, but polishing will restore the original brightness. With old brass, when the lacquer is worn off and the surface is rubbed it loses the peculiar dark tone and becomes polished. Brass or bronze which is unlacquered often attains a more pleasantly even, "worn" look than lacquered metal. Plated hinges or butts are satisfactory for the interior of a house, but a plated surface should not be used on the knobs or escutcheons. As there are three different grades of plating, the quality should be of the best, because the difference in cost does not compare with the difference in length of wear.



Specially Designed Hardware

A jaunty individuality has been given these casement fasteners which were made to order at little more expense than stock design. Eleanor Raymond, of Frost & Raymond, Architect

#### HEATING

THE most common methods of heating, arranged in the order of the cost of installation without regard to the cost of operation, and with the exception of fireplaces, are warm-air furnaces, steam boilers, hot-water systems. Open fireplaces do not come under the classification of mechanical equipment, even though, in a small house or in a warm climate, they may

be all the heating that is required. Where a heating plant, as such, is to be installed, the choice depends first on the local climate and theseasons in which the house is to be occupied; second, on the size of the house; third, on the fuel available; fourth, on the cost of installation; and fifth, on the cost of operation; but perhaps influencing all these, and certainly of vital importance, are the individual tastes and even prejudices of the owner.

Where the home is to be occupied only during the summer, or where the cold season is negligible, a central heating-plant may be dispensed with, or one may be installed merely to take the chill out

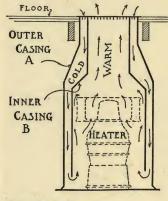
of the rooms in the early morning or after dark. In this case the problem is very simple, and the first consideration is quick distribution of warmth rather than the continued

maintenance of a high temperature.

In a small compact residence the warm-air furnace of the one-pipe style and the recent development of the small hot-water heater, which can be placed in the hall with one or two extensions to radiators, are both very successful. In a house which extends over a considerable area a warm-air furnace is not so efficient, in that the flow through horizontal pipes is sluggish and may be stopped entirely if there is a wind leakage into some part of the building far away from the basement heater, unless a mechanical blower-system is installed;

whereas the circulation of hot water or steam is much less affected, and the radiators can be placed more effectively, and their connections occupy less space, than can registers with their large tin flues. On the other hand, the placing of the radiator is a difficult problem, not encountered in the adoption of the warm-air

The cost of installation and the cost of operation vary in relative importance, accord-



One-Pipe Furnace

This diagram shows one large register immediately over the warm air furnace. Cold air is drawn down through the outer rim of the opening while the warm air rises through the center part

RECIRCULATING
DUCT
SWINGING DAMPER
TO HEATER

Supply to Warm Air Furnace

The cold air duct or box opens directly outdoors and leads to the heater and is joined by a recirculating duct starting at a register face in the hallway. At the junction is a hinged damper to control both passages

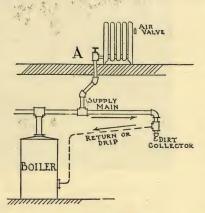
ing to the length of time that the heating system is to be in operation each year. In a summer residence, where the furnace will be used for only a few weeks in the spring and autumn, the first price is the most important. In a house for year-round occupancy, where the winters are long and cold, the upkeep should be the determining factor.

Finally, the owner's tastes must be taken into account. Some people will complain of the excessive heat of a steam radiator; others will fear that a radiator in a hot-water system may freeze and break; that a recirculating warm-air furnace means the constant distribution of dirt and germs; that oil will clog; that ashes are too much of a nuisance. No system is absolutely fool-proof, and no system will run satisfactorily without a fair amount of intelligent care.

It is recommended that the prospective house-builder, if he has not already determined how his needs may best be met, should rely on the advice of his architect, backed by a table of costs of two or more heating-systems adapted to the sketch plan of the house he intends to build.

#### **FUEL**

The fuel which is most available may be the determining factor in the selection of the furnace. For a house built in



One-Pipe Steam System

A diagrammatic presentation of a one-pipe steam system showing the supply pipe starting at the top of the boiler and the return line draining the water of condensation back to the bottom of the boiler

a timbered country far away from rail or water transportation, making the use of coal or oil expensive, a wood-burning grate, whether for a warm-air or a hot-water system, is the logical solution. On the other hand, for a house where coal or oil can be obtained without danger of interruption by storms or poor roads, and where a continuous high temperature is demanded, wood is not suitable, as it requires constant stoking and bulky reservesupplies.

Oil.—This fuel is coming more and more into favor. Although many

householders refuse to use it, believing that as yet oilburning apparatus has not been brought to perfection, others have been glad to be pioneers in its adoption. For the most part these latter have found that the saving in time and annoyance and the freedom from the dust and dirt of coal and ashes have more than compensated for any additional expense and occasional adjustments of machinery. There are two main types of oil burners; the automatic or motor-driven and the natural draft and gravity feed. The first is dependent upon gas or oil ignition and upon electricity. The second does not work automatically; it must be set by hand and must have carbon removed every three or four weeks. Oil burners are adapted to warm-air, steam, hot-water or vapor, and can be placed in any standard heater. Gas. — This is an easily managed fuel, the use of which, as in the case of oil, eliminates time in handling, and dust and dirt. It has a further advantage in that it requires no storage space. It is a highly efficient fuel, as there is less loss from imperfect combustion than in the case of coal, and it is easily controlled. Natural gas, which is available in some parts of the country, is an inexpensive fuel, and has greater heating-value than manufactured gas. The latter, to date, has proved too expensive for general use; but experiments now being conducted tend to show that, in a house properly insulated, a small, gas-fired heating plant may be used that can be operated at an expense comparable to that for coal.

#### WARM-AIR FURNACES

In principle, the working parts of a warm-air furnace are the fire box, where the heat is generated; the drum or air chamber surrounding the fire box, where the air is warmed; the cold-air box or return circulating-pipe, which supplies fresh air from the outside or air from the building; and finally, the ducts or pipes which lead the heated air to the registers at the point of delivery.

Much of the success of the warm-air furnace depends upon proper installation. This can now be assured by the recent adoption by furnace dealers all over the country of a Standard Code, which specifies the size of leader pipes and the register areas to be used, in relation to the size of the furnace and to the area of space to be heated. Recent improvements in the design of warm-air furnaces have reduced to a minimum the

possibility of coal gases and dirt entering rooms through the registers, and a new device known as an automatic humidifier maintains a comfortable percentage of moisture in the air — an important consideration, as air with a proper percentage of humidity need not be of so high a temperature for comfort as drier air.

Present practice provides for the recirculation of air. Whereas, formerly, all the air supplied to the furnace was taken from outside, it is now known that this supply may consist of the air within the house without any detriment whatsoever to health or comfort. Com-

mon practice provides that the air supply shall be drawn both from the outside and the inside, but excludes positively the air from a basement or furnace room. This use of air already heated, of course, results in a marked saving of fuel. For instance, if the temperature is at zero outside and the cold air at the floor about 40°, it only has to be heated up 30° to reach 70°; whereas, if it were drawn through a cold-air box, - that is, a connection direct to the outside of the building, — the air would have to be heated 70°; and to anyone who has observed how much more robust and vigorous the furnace seems to be on a warm day than in a cold snap, the immense saving in fuel in reheating already-warm air will be at once obvious. On the other hand, there are certain fresh-air enthusiasts who maintain that it is unhygienic to pump the dusty and possibly germ-laden air around and around through the house, rather than draw in comparatively clean air (no matter how cold it is) from the outside. In answer

to the fresh-air advocates the fuel economists may well reply that in the average home, when there is a pronounced difference in temperature between the interior and exterior, there is a constant force urging the hot air to escape outwards and urging the cold air to be pressed in to replace it. In other words, every chimney, vent, or crack under the eaves, around the windows or at the bottom of the doors is offering an opportunity for warm air to escape upward or fresh cold air to enter in.

It is necessary in planning for the warm-air furnace to provide a wall arrangement that will take care of ample-sized pipes; also to allow a slightly greater stud in the cellar. The warm-air furnace is inexpensive to install and is effective if properly adjusted to the area to be heated. It is adapted to quick firing and distribution of heat and even greater promptness in cooling off.

The One-Pipe Furnace. — The one-pipe or, as it is sometimes called, the pipeless furnace, has been designed especially for the very small house or for a summer cottage when a slight amount of heat is desired in the spring and fall. The heater is placed directly below the hall or living-room, delivering there all the air that is warmed and drawing in the cold air along the floor, both operations taking place through one register, placed directly above the furnace. A diagram of heater and register on the preceding page makes this clear. The heating of other rooms is dependent upon a free circulation of air throughout the house, which means, of course, that inside doors must be kept open.

#### STEAM BOILERS

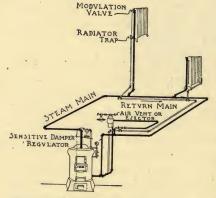
The steam-heating systems most frequently employed in houses may be classed as steam or vapor-vacuum; as two-pipe or one-pipe; and as semi-indirect.

Steam. — With direct steam the radiators are either very hot or cold, the valves cannot be adjusted for half-way temperatures, and the fire has to be hot enough to keep up a good pressure if steam is to pass through the piping and so give warmth.

Vapor-Vacuum. — The advantages of vapor-vacuum have made it a much more popular form than direct steam. With this a valve is installed which allows the air to escape from the piping and radiators as the steam advances, but which does not allow the steam to escape nor the air to return. When, therefore, the steam gives off its heat and condenses into water, a partial vacuum is created. This vacuum sucks the water vapor from the boiler and maintains a circulation through the system, even though there are only a few ounces of pressure at

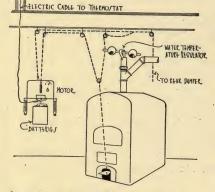
the boiler. The hand valves at each radiator can be adjusted to allow moderate temperatures. The condensed steam returns as water to the boiler, by gravity in the simpler systems and by pump where the boiler cannot be placed well below every part of the radiation.

Two-Pipe System. — When there is a supply line of piping with branches to each radiator and a return line with branches from the bottom of each radiator, it is known as a two-pipe system. This ensures



Two-Pipe Vapor System

With this system the air is driven out of the pipes and so allows circulation of the water vapor at a lower pressure and under better control than with ordinary steam



Automatic Heat Regulator

This diagram shows the damper controlled automatically by a thermostat which is placed at any convenient spot in the living-room or hall

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ready circulation, but the installation requires no small amount of material and labor. It is important with this system that both valves be either opened or closed or else the boiler will crack.

One-Pipe System. — When only a short loop is made by the supply line, which is connected into and becomes the return line, and only a single branch is extended from it to each radiator, the system is known as one-pipe. This costs less to install and is good for a small house, but it is not so efficient as the two-pipe system for a large residence.

Semi-indirect System. — A modification in the location of the radiator rather than in the circulation of the steam is the main feature of the semi-indirect system. To mask the unsightly appearance of the radiators and to ensure fresh warm air rather than a dead, dry heat, the radiators (in a modified form) are placed below the floor, in sheet-metal enclosures, with intakes through the house walls and registers above them. The fresh-air intake as well as the register is controlled by hand. In this case each indirect radiator or pipe-coil acts as a separate small warm-air furnace. Such an installation adds considerably to the expense.

#### **HOT-WATER SYSTEMS**

The essentials of a hot-water heating plant are the fire box, surrounded by the water-jacket with as much of its surface as possible exposed to the hot gases before they pass up the chimney; supply and return pipes to the radiators, and an open tank or a controlled-expansion tank at the topmost point in the system. If this tank is open, the water is at atmospheric pressure and would turn to steam at 212° Fahrenheit. If, however, the pressure is controlled by a mercury column which adds ten pounds to the atmospheric pressure, the water can be raised to about 240° without boiling, the size of the radiators can be greatly reduced, and the temperature can be raised more quickly. A diagrammatic presentation of such an arrangement, on the preceding page, makes the principle

Heating with hot water has many advocates, owing to ease of control, low fuel-consumption, and even temperature. Instead of the rapid heating and cooling noticeable with direct steam, hot water gives forth a steady warmth. While there may be arguments against hot-water heating on the score of initial expense, the general verdict is extremely favorable, especially for medium-sized houses. Recent perfection of small-size hot-water boilers has brought this method of heating down to the scale of the small house and even of the garage.

#### AUTOMATIC HEAT REGULATION

The automatic heat regulator consists of a thermostat conveniently placed upon the wall of the hall or living-room, connected by means of a low voltage wire to a control motor in the basement, which operates the draft and check of the coal boiler or the oil or gas valve. In addition to the thermostat, which operates the heating system in accordance with the temperature requirements of the living-rooms, a limiting or safety thermostat is placed on the heating plant. This safety thermostat prevents overheating of the heating plant in warm-air systems, overheating of the water in hotwater systems, and excessive steam pressures in steam or vapor plants.

The daily evidence of the source from which you derive your comfort and convenience from perfect heat-regulation is the thermostat, a bronze or silver enclosed mechanism, presenting a small thermometer and clock to view. Below the thermometer is a small dial which can be set for the degree of temperature desired during the day. The clock enables you to regulate the hour in the evening at which you desire to lower the daytime temperature automatically to one suitable for the sleeping-hours. Another adjustment determines the hour at which the thermostat will automatically raise the temperature to daytime warmth before your own arisinghour. This initial adjustment when the thermostat is installed is the only attention necessary on your part beyond the weekly winding of the clock, for from then on the adjustments are entirely automatic, and the thermostat and clock will automatically maintain both the daytime and nighttime temperatures, automatically changing from one to the other at the hours you have designated.

The cost of installing an automatic heat-regulating system is very low, averaging approximately 1% of the average six- to seven-room home.

#### **INSULATION**

There are two general types of insulation against variations in temperature, which are well worth observing in the construction of small houses. The first is used in floors, walls, and roof, the second around piping and boilers. Both are important and the former has recently been considerably discussed.

In Floors, Walls, and Roofs. — The consideration of insulation is an important matter when the question of heating the house is being discussed. An authority in the matter has recently stated that "our present structures are causing annual leakage-costs of literally millions of dollars' worth of heat." Because this heat could not be measured and has not actually been missed, the problem has not in the past been given the serious attention it merits. Recently, however, engineers have realized that here is a place where real conservation can be effected, and manufacturers have responded to the need by putting upon the market insulating materials whose use is rapidly increasing. Moreover, new materials for this purpose are appearing almost every month.

All materials permit the passage of heat, some more than others, and it naturally follows that those which are the poorest conductors are the best insulators. Insulating materials come in various forms, flexible, semiflexible, and rigid, and are composed of such widely differing materials as eel grass, ground cork, cane fibre, flax fibre, and asbestos. Some are applied between the studs; others are nailed directly to the studs and serve as a base for plaster, thus eliminating laths. A good insulating material should also be a fire retardent; it should be non-absorptive, permanent, and reasonable

A satisfactory insulating material one inch thick is equal to 334" of wood, 41/2" of plaster, 12" of brick and 18" of concrete. Figures are not yet available to show conclusively the amount of saving effected by the use of an insulating material, but it is claimed that careful insulation in an ordinary residence will result in a saving of 25% of the fuel cost, a very considerable factor.

Around Piping and Boilers. — In order to maintain the temperature in hot-water pipes, and to prevent cold-water pipes from sweating and becoming warm in summer and to prevent their freezing in exposed positions in winter, they are jacketed with sectional covering. Corrugated asbestos paper, forming separate air-cells and covered on each side with wool felt, is placed around the pipes, which are afterward wrapped with canvas. This covering is held in place with brass bands. Boilers and hot-water tanks may be covered with magnesia plaster, one or more inches thick, containing enough white Portland cement to give it a hard, glossy surface. A less expensive method is to pack pipes in outside walls, or in floors by tamping in, between the studs or floor joists, mineral-wool, asbestos fibre, or other vermin- and fireproof materials fabricated for this purpose.

#### XVII

#### PLUMBING

TO the householder the plumbing is often a dark and mysterious system, subject to unforeseen breakdowns, although, of late years, continuous improvements have eliminated many former sources of annoyance and expense. Indeed, modern plumbing, considering the wear and tear to which it is subjected, is one of the most durably satisfying purchases a home-builder makes. With the home-builder

plumbing is a matter commonly left to the judgment of the architect or to the good faith of the contractor.

The plumbing system consists of the supply of water; its distribution through the house; its heating; arrangements for waste materials and venting; plumbing fixtures; and disposal of the waste after it leaves the house.

#### WATER SUPPLY

Public Water Service. — If there is a public water service, the problem of supply can be easily and inexpensively solved. The size of the main pipe, the digging of the trench for it, the necessary permits from the authorities and what connections are to be made by them, are about the only points requiring consideration.

Gravity System. — In the open country, if a gravity system from a hillside spring can be installed it is by all means preferable to pumping. Under ordinary circumstances it costs no more to install and much less to run. The preparation of the reservoir, the strainer, and the protection from frost are important.

Pumping. — If it is necessary to pump, the motive force most economically obtainable should be used. The motor may be run by electricity (which is the simplest) or by gasoline. It may be a wood-burning hot-air engine (a sturdy and practically fool-proof form of pump), a windmill, or an hydraulic ram if there is a stream with sufficient dro

ram if there is a stream with sufficient drop to generate steady power.

The important thing in a pump is that it shall stand up to its work month in and month out and that, if anything does go wrong, spare parts can be promptly obtained and repairs easily made.

#### DISTRIBUTION

Tanks. — If a pump is required it needs a tank in which water can be collected for use when the pump is not running. For a country establishment, with barns and gardens which must be watered as well as the house, a large tank is raised on a rigid framework, and both for appearance and protection from the weather is cased in with a wall treatment similar to the rest of the plant. For small houses an open or gravity tank is placed in the attic, or a pneumatic or pressure tank is placed in the cellar or underground outside the building. The open tank in the attic should have an overflow leading through the roof to the outside gutter, and full precautions must be taken that the framing beneath the tank is strong enough to support it. The attic tank is more susceptible to

extremes of weather than a tank in the cellar or underground; the water may become warm or "flat" in summer; the connections to the tank, if not properly protected, may freeze in winter, and a leak will do more damage in the attic than in the basement. An attic tank is the best form when a small but constant supply can be obtained from a spring.

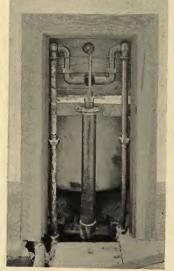
With the pneumatic tank the water is pumped into a sealed iron cylinder, compressing the air, and this

iron cylinder, compressing the air, and this pressure forces the water out through the house pipes. This system requires a pump with a fair amount of power; it costs a little more than the open tank of equal capacity; if it gets out of order it is more difficult to repair. With either form of tank it is better to have it too large than too small. It should be remembered that the modern householder uses more water than was used a generation ago, and so the formulas for the sizes of attic tanks usually need revision to accommodate our present-day demands.

Piping.—Where there is a public water supply the line connecting with the water main in the street should be of sufficient size to permit a continuous flow of water on all floors at a given time. This water service pipe should be at least <sup>3</sup>/<sub>4</sub>" diameter, but it is better to have a 1½" pipe. The kitchen sink and laundry tubs should have at least a ½" pipe, and lavatories one from <sup>3</sup>/<sub>8</sub>" to ½". There should be a shut-off valve where the supply line enters the house, another at the base of all vertical risers, and one under each fixture. At the lowest point in the system there should be a drainage cock. The shut-off and drainage cocks allow any part or all of the system to be shut off in case of leaks, or when the house is closed. They should be conspicuously labeled.

Supply pipes may be of genuine galvanized wrought iron or of brass. Lead should be avoided because of the danger of lead poisoning. The character of the water determines largely the choice of material, and especially when the water is soft is this important, as soft waters are more corrosive than hard waters. An analysis of the water may usually be obtained from the State department of health or a reliable local plumber may be consulted as to the character of the water supply and the material best adapted to it. Hot water distribution is commonly by brass pipe which, to be satisfactory, should contain at least 67% of copper. If it contains too large a percentage of zinc this metal is likely to be corroded in spots and at the joints, causing leaks. Brass pipe does not clog with rust and so smaller sizes may be used.

Supply lines should not be run where they will be exposed to the danger of freezing. If they have to Le in the exterior walls or other floors where they are exposed to cold drafts they should be wrapped with insulating pipe-covering, or packed in mineral wool or similar vermin-proof and fireproof material. Hot-water pipes, if uncovered, should not come within 6" of cold-water pipes.



Waste and Supply

The cover of this "access panel" in the bathroom wall has not yet been installed on the hall side. In the middle is the large pipe for waste, connected to the end of the built-in-tub, and on either side are the hot and cold supplies, connected to the back of one central faucet

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#### HEATING

The system for heating water for household use (and this must not be confused with a hot-water heating-system with boiler and radiators) depends on the amount of warm water required in the kitchen, laundry, and bathrooms, and on whether there is a fairly constant use of a coal or wood kitchen range or furnace. Where gas or electricity is available a number of very convenient and quick-acting heaters are on the market, of which the smaller ones supply water direct to the faucets and the larger types to a storage tank, preferably of copper. These are made either hand-operating or automatically controlled by an adjustable thermostat.

Where there is a coal range in daily use or a furnace which runs continuously during cold weather, a hot-water coil or fire-back can be installed which, if connected with the storage tank, will give a constant warm supply, and will reduce the amount of gas or current needed in the separate hot-water heater.

In large houses it is economical to install a small coalburning hot-water heater, as this requires only a shovelful of fuel a day and very little attention.

#### WASTE MATERIALS AND GASES

In addition to the removal of sewage and waste from the different parts of the house, which is a comparatively simple matter, the venting or arrangement for the escape of gases must also be included. If within municipal limits there will doubtless be state or town plumbing ordinances which must be followed, and which usually are rigorous in their requirements. If in the open country or in a community where there are no building regulations a small plumbing system may be simplified without danger.

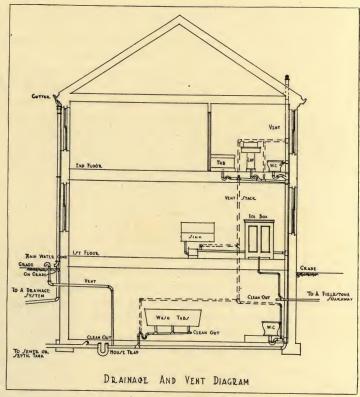
Simplicity of design includes the placing, if possible, of all the fixtures, including water-closets, sinks, and lavatories, as close together as possible — not only on each floor, but one above the other vertically. In this way a single stack of plumbing can be used, as shown by the diagram.

If there are no plumbing codes, the specifications must be particularly exact to avoid unsanitary or defective installations. When saving money is attempted it should be by the economical design of the system rather than by installing cheap work or materials.

There are two possible systems; one with and the other without back venting. In each there is a main soil-pipe not less than 3" in diameter, vented at the top above the roof, passing down through the house with branches to the various fixtures, and terminating at the cellar floor in the house drain.

Back Venting. — In the back-vented system, a 2" mainvent pipe is connected to the main soil-pipe where it comes above the cellar floor, and runs up parallel with it to just below the roof; there it joins the soil-pipe once more. To the main-vent pipe, 1½" branch vents are connected from the S-trap at each plumbing fixture. Both the main and branch vents should be of galvanized iron. The branch vents formerly were connected directly to the crown of the S-trap, but this was too near the water seal. It is better to use the modified S-trap with a small T-Y connection, which gives what is known as continuous venting. Two fixtures which are close together, such as bathtub and lavatory, can be linked up with the branch vent. This is called for by the majority of plumbing ordinances.

Without Back Venting. — In the system without back venting, the old-fashioned S-trap had a connection to the roof for venting and so keeping the water from being siphoned out, in which the water was held as a seal to keep the gases from coming up through the outlets in the fixtures. There are now non-siphoning traps on the market, so arranged as



Plumbing Diagram

The house drain is shown below the cellar floor with its trap, clean-out, and fresh-air vent at the left. At the right wall it becomes a vertical run and is called the "waste," into which smaller branches from the different plumbing fixtures enter. These are vented (as shown by the dotted lines) and the vent stack connects near the top with the 4" waste leading out through the roof. Quite apart from this system is, at the right, the drain from the icebox pan to a dry well and, at the left, the rain-water conductor, from the gutter, which empties on to the ground or into a "surface-water" drain, separate from the sewer

to dispense with the elaborate piping needed for venting. If the non-siphoning traps are used, and the plumbing fixtures on each floor are approximately above each other, then the soil-pipe extended up above the roof serves as an ample vent. If sinks, laundry tubs, or lavatories cannot be connected to this stack or vertical system of piping, then a two-inch waste is sufficient for them (but not for water closets); and this smaller soil-pipe must also extend to above the roof and be increased to 4" in diameter in cold climates to prevent it from becoming clogged by frost.

Drainage. — The main soil-pipe, usually placed under the cellar floor, should be at least 4" in diameter and given a pitch of 1/4" to the foot. Either just inside or outside the foundation walls a "house trap" should be installed with an inlet on the house side for fresh air to enter the system.

The house-drain, soil-line, and waste-line are made of extra heavy cast iron; the joints are packed with oakum and then closed tight with soft pig lead hammered into the "hub" at the joint. Branches are of galvanized wrought iron, or sometimes of lead, although that is not so satisfactory. The exposed portions of pipes are made of brass and are nickel-plated, especially in bathrooms and pantries; otherwise they are painted. The ordinary "wiped" joint, made by soldering, is satisfactory for connecting lead pipe or lead and brass pipe; but where lead and cast-iron pipe are connected a brass ferrule must be used to make the junction. The joints on the ordinary wrought-iron pipes are screwed.

The branch soil-pipes for water-closets should be at least 3" in diameter; the waste-lines for bathtubs, lavatories, and

laundry tubs 1 ½" and for kitchen sinks 2". For bathtubs and laundry tubs a 2" pipe is worth the slight additional expense. Wherever possible the pipes in the floors should run parallel with the joists; this will avoid cutting each timber, which involves considerable labor and also weakens the framing. Vertical 4" pipes are too large to be enclosed in ordinary partitions, as 2" x 4" studs do not leave room enough for the hubs of the pipes to clear the plaster; either the partition must be thickened or the pipes must be run in out-of-the-way corners in closets.

The soil-pipes from water-closets may be packed with pipe-covering or in mineral wool to deaden the noise of the flow of water.

#### FIXTURES

The most important plumbing fixtures include: waterclosets, lavatories, baths, sinks, laundry trays and showers. These fixtures may be made of earthenware — which includes both vitreous china and porcelain or enameled iron.

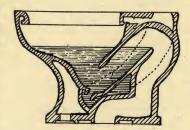
Vitreous china is an impervious white clay material that is covered with an extremely hard and impenetrable glass surface.

Porcelain consists of a softer buff color fire-clay body that is protected with a heavy coating of vitreous china and then covered with the same glaze as vitreous china ware.

Enameled iron, as its name implies, is made by baking an

enamel on the iron, which gives it a very smooth white sanitary finish, and while its surface is not as hard and impenetrable to stains and soil as that of earthenware, it does, nevertheless, prove satisfactory when given the proper attention. Being less expensive, it is used very extensively in residences of moderate cost.

Water-Closets. — Water-closets are commonly made of vitreous china. There are two distinct types in the market



Siphon Jet Closet

This section shows a closet of the siphon jet type, which is the only satisfactory kind for residence use

but the only one that is satisfactory for residence use is what is known as the siphon jet closet. The siphon jet has a stronger and more thorough action, larger water surface which minimizes the soiling surface of the bowl, and a deeper water seal protection against sewer gas than any other type. The difference in cost between this and less expensive closets is so slight that it should not be considered except where the most stringent economy is necessary.

Aside from embodying the essential requirements of a first class water-closet, some siphon jets are also made with additional features, such as the extended lip, raised rear vents and silencing features.

For residential use closets should be operated by either a high or low tank; the latter being preferable owing to its better appearance and quieter operation. While the tanks are made of various metals, those of vitreous china are obviously the best, since there are no metal linings to wear out, and being made of the same material as the closet, they have the same durable sanitary glaze, which gives a uniform and permanent finish to the combination.

The seats are usually made of wood with different grain finishes or white enamel. In some combinations the seat posts and connections between the closet and tank are encased in china, thus giving the entire combination an all-white finish and eliminating every particle of exposed metal, which is liable to tarnish and mar its appearance.



Sheet and Metal Sink

In the pantry German silver is a satisfactory material for the sink, as it is less likely to break delicate dishes. The goose-neck faucets also cause less breakage than the low type and are convenient for the filling of pitchers and vases

Lavatories. — Lavatories may be made of vitreous china or enameled iron. They may be of the pedestal type or supported by brackets against the wall, which leaves the floor



Enameled Iron Sink

With this set-in sink of enameled iron the wooden drain boards are made to overlap and are provided with a drip to carry drain water into the sink

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Bathroom Fixtures

The tub is built in, the lavatory has glass legs, the watercloset a low-down tank and a white cover. The glass shelf and glass towel bar and the white enameled stool are all in keeping with the tile floors and walls

unobstructed. The top may be free from the wall or have a back built up against the tile 6" or higher. Although fitted with various supply fittings, the most desirable type is the integral china nozzle which permits the water to be tempered and discharged from a single spout. This allows one to wash in running water, and is generally recognized as far more sanitary and desirable then drawing water in the basin, which is necessary where individual hot and cold faucets are used. In better lavatories the pop-up type of waste is always used owing to its superior sanitary features.

The dental lavatory, which has a flushing rim that is connected with the supply nozzle so that it flushes continuously while the bowl is in use, is also a very useful adjunct.

Baths. — Baths are made of both enameled iron and porcelain. Whether porcelain or enameled iron, baths are now made almost exclusively of the built-in models, where the back and one or both ends are placed flush with the wall and floor, leaving no space under or in back of the tub where dirt and dust can collect. They are also lower than those which are set upon feet, which makes it much easier for one to get in and out.

Formerly enameled iron baths were only glazed inside, the outside being coated with paint. They are now, however, made on the same plan as porcelain baths, with all exposed surfaces enameled both inside and out.

Sinks and Laundry Tubs. — Pantry sinks are still generally made of sheet metal, — preferably copper or German silver, — partly on account of expense and also because the thin metal is less likely to break delicate dishes. For kitchen sinks, where there is rougher usage, the free-standing units of heavy enameled iron or porcelain are better. Laundry tubs may be of porcelain, enameled iron, slate, or soapstone; the last named is sometimes the cheapest and it is very durable, but it is not so cleanly or attractive looking as any of the others.

Faucets. — Faucets may be nickel-plated or porcelain-covered. In fact, there is a great range of choice and the selection depends primarily on individual taste and relative

cost. There are several varieties on the market and one of the newest and most satisfactory is the one-nozzle fixture delivering both hot and cold water, which may thus be mixed to any desired temperature. One type contains also the waste control in the same fixture. It is possible to obtain a fixture with a single swinging nozzle which can be pushed back against the wall or back of the sink when not in use, thus doing away with a common cause of dish-breakage. For the pantry sink there is the gooseneck nozzle, which curves up away from the sink — also for the purpose of safeguarding against breaking and nicking.

Showers. — Showers may be set in stalls or at the end of the tub. If they are installed in connection with the tub a curtain is generally used to prevent the water from spreading beyond the tub, although there is one type of wall shower which does not require a curtain. There are various devices connected with the shower which have made it a desirable feature of the bathroom, even for the less expensive house. A mixing valve makes it possible to obtain the desired temperature at once and a lever regulates the force of the water.

Accessories. — There are on the market many accessories for the bathroom, designed for our convenience or for contributing to the attractiveness or the sanitary condition of the room. Built-in features such as china-soap- and paper-holders, safety grips, glass- sponge- and toothbrush holders, come in various combinations for use with tiled walls, which are cemented in place when the tiles are laid. Towel bars, the newest ones square to prevent the slipping of towels, hooks and glass shelves of a material to harmonize with tiles, can be placed in the same way. Small storage or medicine cabinets, either of wood or steel, are preferably built into the wall.

#### SEWAGE DISPOSAL

The disposal of sewage and waste water outside the house is comparatively easy if there is a public sewer. The plumber carries his iron pipe through or under the foundation walls and four or five feet beyond them. Care must be taken that there is no chance of settlement of the foundations, which would break the piping. Some cities require — and for more than a small job it is good practice—at this point to install a masonry manhole, so that the trap and the cleanout giving access to the run connecting with the sewer can be easily reached.

It is customary for the general contractor to install the tile pipe from the point where the plumber leaves off down to the sewer where the connections are made by him under the direction of the municipal authorities; or, if made by them, then the specifications should note that the contractor is responsible for the charges.

Cesspools. — Where there are no public sewers the old-fashioned way was to discharge the waste into a cesspool. With loose gravelly soil the liquids would drain off, with a chance of polluting any near-by well or spring. The solid matter would gradually accumulate, choking the openings through the sides of the cesspool and requiring removal every few years.

The Septic Tank. — The better and more modern system is the installation of a septic tank and a disposal field. The septic tank consists of a tightly covered concrete box where bacteriological action is constantly taking place, breaking down and dissolving the solid matters, which are finally rendered harmless from the hygienic point of view, by filtration. The most hygienically complete plant contains a disposal field, where the overflow is discharged into one or two series of radiating lines of tiled drain-pipe set 1' to 18" below the surface, with open joints allowing the liquids to be distributed under a wide expanse of sod. The sun and air rapidly disinfect and dry up the liquids.

#### XVIII

#### ELECTRIC WIRING AND GAS-PIPING

THE wiring of a house by the contractor includes connection with the service main, installing the supports or conduits for the wires, and running the wires to the switches and to the outlet boxes. The light fixtures are seldom included in the same contract, as the owner selects them later. The meter is usually installed by the company supplying the current, upon application by the owner and, in some instances, upon the payment of a fee.

#### SERVICE CONNECTION

Before the specifications are written, it is necessary to obtain from the public service company information cover-

ing the current supplied, whether alternating or direct; where it will be delivered, that is, at the pole, or at the outside wall of the house, or underground; what charges are to be made and what regulations must be complied with. A reliable electrical contractor should be consulted and all details of the service connection should be considered when making estimates of the cost.

#### WIRING

Supports and Conduits. — If there are local building-ordinances, they may limit the methods of installation; but if there are none, all the more precautions are needed to prevent defective and even dangerous workmanship and materials. The copper wires which carry the electricity are covered with a rubber wall and cotton braid to in-

sulate them. This nonconducting wrapping prevents the current from short-circuiting — which, besides wasting the power, may generate heat and set fire to adjoining woodwork.

The cheapest method of supporting the wires is known as knob and tube, the next in cost is the flexible cable, and the most expensive is the conduit.

KNOB AND TUBE. — The knob-and-tube installation is for-bidden by most building-codes and should not be used except where every cent must be saved. With this method the wires are run in the partitions, between the floors and ceilings, and even exposed in the rooms, protected only by their own thin insulation, except where they pass through studs, joists, or other woodwork; there porcelain tubes are inserted to prevent cuts and chafing. The wires are held in place by porcelain knobs or cleats fastened to the timbers or plaster work. The installation once built in cannot be easily altered and, as there is always the danger of rodents gnawing off the insulation or a carelessly driven nail causing a short circuit, this method is not recommended.

FLEXIBLE CABLES. — In the flexible cable or B X cable, two or three insulated wires are cased with a continuous ribbon of galvanized metal, forming an ironclad cable. This can be run conveniently through small holes bored in the timbers, behind baseboards, and around corners, and it gives a con-

tinuous protection to the wires. The cable should be secured in place by light metal clamps, not by bent nails.

conduits. — Electric conduits are iron pipes, coupled together and bent into easy curves where needed. When in place, connecting the service switchboard and all the outlet boxes and room switches, the wires are fished through the conduits by means of a long stiff steel wire. Conduits ensure a waterproof and sturdy protection and also allow changes in the wiring. As the labor and material both cost more than the B X cable, conduits are not used extensively in small houses, except where the wires are to be carried under a concrete floor or where a number of wires are grouped to-

gether, as from the service switch to a cut-out cabinet or point of distribution. On the other hand, when used they ensure dependability, long-time service, and the greatest measure of protection from short circuits which may cause fires.

Outlets. — Where switches, light fixtures, plugs, or other electrical appliances are to be connected at the surface of the wall, floor, or ceiling, outlet boxes or switch boxes are installed, consisting of pressed-iron square or cylindrical cases. To these the wires are pulled and the ends are connected to the switches and plug outlets, or left wrapped in tape ready to link up with the wires of the light fixtures. The boxes also serve as supports to which the light fixtures are to be attached. A type of outlet box

1½" deep is to be preferred, as it will permit the use of shallow canopies.

A special mechanism of great convenience is the three-way switch, which allows the current to be controlled from either of two points, instead of only at the fixture itself or at one wall switch. This feature makes it possible to turn the lights on when entering a room, and off when leaving by another door. It is adapted especially for turning on and off a hall light from the story above or below. The button illuminated by radium paint, and the tumbler switch, which is more easily operated than the button, are recent improvements.

Layouts. — Apart from the technical side of electric wiring, as touched on in the preceding paragraphs, the home-builder should familiarize himself with the way the layout is to be indicated on the drawings. He should try to visualize the plans as the completed house — not as sheets of blueprints. He should sketch out how the furniture will be arranged, and determine the location of the light outlets so that they will be convenient for the dressing-tables and beds, for lighting stairs and closets, for bathroom mirrors and kitchen sinks, and as decorative features over mantelpieces and sideboards. In addition, the portable lamps, more and more used in living-rooms and bedrooms, must have ample base-plugs allotted for them. Duplex receptacles permitting the use of two cords from one receptacle are to be recommended.

#### Some Definitions

The following terms in common use in connection with electrical energy will be found convenient for reference. They are reprinted from the "Architect and Engineer."

The unit of electrical current is the ampere.

The unit of electrical pressure which causes the current to flow through a conductor is a volt.

One ampere of current at one volt pressure equals one watt of power.

A kilowatt is one thousand watts.

A kilowatt-hour is one thousand watts for one hour.

A horsepower is 746 watts.

A horsepower hour is 746 watts for one hour.

Ten 100-watt lamps burning for one hour consume one kilowatt hour of current.

Forty 25-watt lamps burning for one hour consume one kilowatt hour of current.

#### THE HOUSE BEAUTIFUL BUILDING ANNUAL

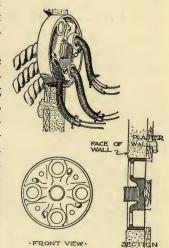
Switches must be located conveniently and yet be inconspicuous, placed near the wood trim — not in the centre of large plastered areas. New switch plates are available, of glass, which are less conspicuous than those of brass. But even the

latter can be distinctly improved in appearance by a coat of paint the color of the walls or woodwork.

A table reproduced on page 24 shows the conventional indications of wall and ceiling lights, base plugs, gas outlets, switch connections, and the like. For small installations it is usually sufficient to indicate by a dotted line the relation of the light and its controlling switch; but where especial care is taken with the working drawings, all the runs of wires and the location of the cabinets and distributing points are drawn in as well.

Lights may be controlled by a key or by a pull-socket at the fixture, — which is the least expensive system, — or by a wall switch, which adds not

only the slight expense of the mechanism itself but also that of the additional wiring. This is, however, a comparatively small item, considering the added convenience.



Bad Type of Outlet

As this shallow box is not capable of housing the spliced joints of wires, a deep and objectionable canopy on the lighting fixture is necessary



Flexible Cable

The electric-light wires are insulated and enclosed in metal. Here they are brought to the face of the wall and the ends of the wires stripped ready for connection to the switch. The cover plate will be installed after the plastering is completed As well as for lights, outlets should be planned for the long list of electrical appliances now on the market, which can be plugged into a wall or floor receptacle. For the dining-room there are toasters and percolators; for the kitchen and pantry, plate-warmers and dish-washers; for the laundry, irons and clothes-washers; for the bathrooms, curling-irons and bottle-warmers, and for the halls, vacuum cleaning stations. Pilot or telltale receptacles are recommended for certain devices to show whether the current is on or off, especially convenient in the pantry, in connection with the cellar light, and with an iron.

If the location of these outlets is called for on the estimating drawings, they will cost little; but if included as an afterthought, when the plaster and interior trim are up, they will

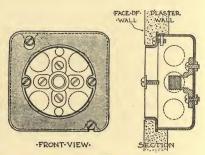
prove to be expensive.

Panel Board. — While the use of a comparatively high voltage is usually necessary for distribution of electrical energy throughout the community, the use of such high voltage in houses would be unsafe. This high voltage must, therefore, be transformed to a lower voltage before it enters the premises, and an excess of current in the wires of the interior wiring system must be avoided. This is done by means of fuses, which, when they blow out, as they may do for one cause or another, must be replaced by those of proper size and style. A new safety type of panel board which contains the fuses is on the market, with which it is possible for anyone to change a fuse without any danger whatever. The location of this panel board is a point to be taken into consideration when the wiring is being installed.

Power Service. — In many communities cheaper rates on current may be had when it is to be used for power and not lighting. If there is to be much cooking, refrigeration, or cleaning to be done by electricity, the added first-cost of a separate system will be justified.

Electric Bells. — Quite apart from the wiring for light and power is the low-tension system including the doorbells,

annunciators, "house" or intercommunicating telephone and other services, which require little power and are run by dry batteries or dry cells, or by the more lasting and dependable device, an electric bell-ringing transformer. The wires must be insulated, but do not require metal or porcelain protection in addition. Different-colored wrappings on the wires are a convenience to designate



Good Type of Outlet

This deeper box is large enough to hold several conduits and requires therefore only a shallow backplate

different services. Doorbells, kitchen buzzers, and their location should be included in the contract, as it is cheaper to build them in while the house goes up.

#### **GAS-PIPING**

Each year the use of gas in the new residential construction is more closely restricted to fuel rather than illumination and, as the amount of piping required is inconsiderable, it is frequently included in the specifications and contract for the electric work. Here, again, the regulations of the public service company must be met as they apply to the connections with the main, the size of pipes, and the location of the meter. Needless to say, the first requisite is that all the piping be absolutely tight. In addition, pockets or low loops in the system should be avoided, for where water may condense and collect in cold climates, such water may freeze and choke the flow.

#### APPENDIX

#### ITEMS NOT IN THE GENERAL CONTRACT

THERE are certain essential fittings in a house which it is customary to cover by contracts separate from that for the general construction or else by cash allowances, included as definite items in the general contract. Some of this equipment—storm windows for instance—may not be needed immediately, and so purchase may be postponed until after the heavy bills have been met, or the house has been occupied for a year and weather conditions are understood.

Other types of equipment, like lighting-fixtures, are so largely a matter of personal taste that it is easier to make the selection by the inspection of samples than by specifications.

Certain equipment, however, like weather strips, may be more easily installed under the general contract during the construction of the building. In such cases, after the owner has compared different types and prices, a flat allowance for the material can be included in the estimating specifications.

The following items fall into this group: Storm windows; Weather strips; Lighting fixtures; Window shades; Screens; Dumb waiters, and Lightning rods.

#### STORM WINDOWS

It is easier to build a warm house than to heat a cold one. In figuring the size of the heating plant, let us measure the quantity of heat lost through each square foot of wall or window. A common yardstick is found in the British Thermal Unit (B.T.U.), but in using it we must remember that each material - brick, glass, wood, plaster, and so on - has a different cold-resisting scale. For instance, with the temperature at zero outside and at 70° inside, a square foot of brick wall, 8" thick and furred and plastered, may be considered as wasting 21 B.T.U., whereas each foot of glass window wastes 78.8 B.T.U. In other words, the furnace heat escapes nearly four times as fast through the window as through the wall. Now if a storm window is put on the outside, the glass-thickness is doubled, an air space is added, and the heat consumption is reduced by more than half, or to 31.5 B.T.U. per square foot. It is obvious, therefore, that in cold climates the initial cost of storm windows, especially if placed on the sides of the house with the coldest exposure, will be covered in a few years by the saving in cost due to reducing the size of the original heating-system and by the annual saving in fuel.

Storm windows are usually made in one large sash, with a single hinged or sliding pane which can be opened for ventilation. All storm windows should have attachments like bolts or hooks, which will allow them to be removed easily in the spring, for storage during the warm months.

#### WEATHER STRIPS

Wooden doors and windows, no matter how well made, expand in damp weather and contract in dry. In winter, with artificial heat, they shrink so that drafts come in all around the edges. To prevent the leakage of cold air, various types of weather strips have been evolved after long experimentation. In the long run their use will be found so desirable as to amount to a practical necessity.

The characteristic weather-strip is an interlocking metal device, usually of brass or zinc, occasionally of bronze. In windows it is set where the sash meets the frame or, in the case of double-hung windows, where upper and lower sashes meet.

On doors it is set where the door meets the frame. For the bottom of the door a simple and practical arrangement is a wooden strip with metal and felt at the lower edge. Fastened to the bottom of the door, this is forced against the threshold when the door is closed, but rides clear of the floor when the door is open. This may often be applied advantageously to interior doors as well, since it has the merit of keeping halls warm when the windows of sleeping-rooms are open in winter.

Weather-stripping requires experience and is something of a specialized trade. For this reason it is well to have the installation made by an agent of the firm selling the material.

#### LIGHTING FIXTURES

With electric lighting the time has passed for the sixteencandle-power carbon-filament bulb, so placed that the glare struck directly upon the eye. Now the Mazda light, rated by watts, can be bought in many degrees of intensity, and the bulb is usually screened from the eye by cloth or tinted-glass shades. Indirect lighting, where the opaque bowl throws the light on the ceiling, is not recommended, because of the unnatural shadowless diffusion of the light and because of the unpleasant appearance of the black circles of the fixture floating below the brilliant white ceiling. In some rooms a certain amount of semi-indirect lighting, where the fixtures combine direct lighting downwards and reflected light against the walls and ceilings, may be desirable. For homelike comfort and charm, portable lamps with wide ornamental and translucent shades are the most attractive and may be combined with the use of a few ornamental brackets. In the kitchen or pantry, where strong direct light is needed, a hanging fixture with a glass shade is the most desirable.

The best way to select light fixtures is by studying the actual forms, materials, and shades in operation, either in your friends' houses or at the dealers', rather than by catalogues. You will find a wide choice in material and finish as well as in shape, and your choice should be based on sound reasons, arising from other details of the decorative scheme of the room where the fixtures are to be used. Among the possible choices are brass, nickel, porcelain, bronze, silver, enameled brass in black and colors, hammered iron and pewter.

Standardized portable fixtures, which can be moved from house to house or room to room, are now obtainable in several designs. Lights concealed in the baseboards of bedrooms and porch ceilings are becoming popular, and there are also great possibilities in their use in beamed or corniced ceilings.

There is a considerable range in price even in lighting-units which look the same, due to the weight of metal, the quality of workmanship and finish, and the use of stock designs. A fuller discussion of this subject will be found in the *House Beautiful Furnishing Annual*.

#### WINDOW SHADES

Even in the commonplace window-shade there are grades and details to be considered, apart from color and price. The weight of the fabric and the type of the coloring matter will determine the life of the cloth and its appearance in use. The sides should be hemmed, as that ensures smooth rolling and protection from ripping. The wooden rod at the bottom should be strong enough to prevent its breaking from ordinary wear and tear. In large windows it should be over I" wide.

Rollers are usually of wood, but in exceptional widths, where more strength is required, tin should be substituted. For special needs there are adjustable shade-holders which allow the roller to be placed at any desired height, so that the

shade may be drawn across the lower part of the window

while the upper part is left uncovered.

Sometimes two shades are installed, one light-colored and one dark. The lighter tone, matching the shades of the rest of the house, is placed close to the glass and shows on the exterior; the darker is placed on the inside and is intended to shut off the sunlight more completely. Where two shades are to be thus used the window frames should be built to accommodate both.

#### **FLY SCREENS**

Netting over doors and windows may be of bronze, copper, japanned-iron wire or galvanized iron mesh. The latter is considerably the least expensive, and if well cared for gives long service, particularly in unexposed locations. Commercially it is the favorite screening. Screen cloth made of various alloys is less uniform than copper screening, which is regarded as the most durable and, if we accept the first cost, the most satisfactory. While 14 mesh (i.e. 14 squares to the inch) will keep out flies, the use of 16 mesh screening is advisable, as it affords protection against mosquitoes and smaller insects. Frames may be of wood or metal. The latter is much more expensive, but takes up less space and is neater.

Screens for doors should have a rail across the middle to keep the frame rigid and a spring to hold them shut. A wise precaution is to have a wire grille, with quarter-inch openings, over the bottom panel to protect the fly netting from strain. In a house of formal elegance a screen door may become a decorative feature by being designed in wrought iron.

On double-hung windows the usual arrangement is to have over half the opening a screen which slides up and down on wood guides, with springs at one side to hold it in place. There is on the market a sliding window-screen of recent invention, which is held in place without the use of springs. By avoiding the lateral pressure on the rims it is ensured greater ease of action. The simple brass control is so constructed as to permit instant insertion or removal of the screen, but once in place, it is securely held there.

Rolling screens work on the same principle as a window shade and are adapted for either double-hung or casement sash. When not in use they are wound on a spring roller

concealed inside a metal case.

For casement windows the screen must fill the entire opening. If the sash opens out, its control lever passes through a slot under the screen; if the sash opens in, the screen is placed on the outside and the blinds must have special hardware to close them, or else the screen must be easily detached

to allow for shutting the blinds. If screens are left for a long time between windows and closed blinds they are liable to rust or tarnish, as there is no circulation of air.

In winter screens should be stored in a dry, well-ventilated place. A convenient method of marking screens is to buy duplicate numbered thumbtacks. By placing the same number on the screen and on the frame of the opening in which it fits, guesswork is eliminated when the screens are put up in the spring.

#### **DUMB WAITERS**

If the kitchen and dining-room are not on the same floor, a dumb waiter is essential. If there are invalids or children on the second floor or a laundry or cool storage-space in the basement, a dumb waiter with shaft-openings on all three floors will be a convenience. The added expense of running the lift from the basement to the second floor is negligible. The cost of building a dumb-waiter shaft while the house is going up is not great and the machinery may be put in later; but installing one in a house already constructed is expensive.

Hand-power machines are the only type appropriate for a small residence, but they should be well designed, carefully installed, and strongly built. An automatic brake is well worth while, as it is an insurance against the "car" falling and

breaking its load of glass and china.

Shaft-openings should be large enough for ease of operation and for access to the working parts, including the counterweight, guides, and gears. Antifriction steel roller-bearings ensure quiet operation and long life for the mechanism. Special lifts can be installed to hoist wood for open fireplaces from the cellar, the opening being concealed under a window seat, preferably located beside the fireplace. These can also be used for the removal of ashes.

Hand-power invalid lifts are practical and safe. These can also be used for moving furniture and luggage. In some communities ordinances require that the shaft enclosure be of fireproof material.

#### LIGHTNING RODS

The lightning rod, first looked upon askance, then adopted, and later derided, is again firmly established, since recent experiments have shown that it is a potent factor in averting fires from lightning. When it is realized that the annual loss by fires from this cause is over \$16,000,000, protection by rodding is worth considering, especially for farm buildings. Rods should be of galvanized iron or of copper, and should be thoroughly grounded.

#### SILENT SERVANTS IN THE HOUSE

NOT many years ago a house was thought to be the epitome of convenience if it contained a carpet-sweeper and a sewing machine. Now there are available for housewives labor-saving devices without end to ease domestic work and shorten the hours of those responsible for the fundamental tasks of family life. But, unfortunately, the inventors move faster than houses wear out, so that not all these appliances can be incorporated in old dwellings. Some are quite impossible because of reconstruction difficulties; others are counted out upon the score of expense. Blessed is the housewife, therefore, whose house is all in prospect rather than in being, for she can call to her aid alike the lessons of experience and the fruits of invention.

The housemother with a new house to plan for, even though it be months and even years ahead, should keep a file

of suggestions as they come to her. These should include her own notes as ideas formulate themselves in her mind, clippings from house magazines and their advertisements, and the catalogues of devices which seem especially desirable. These will be effective when the time comes to talk with the architect, protecting the house of her dreams against omissions almost beyond remedy once the house is built.

#### ELECTRICAL EQUIPMENT

Amid all the mechanical aids to comfort, the convenience of a house is measured to a large degree by the completeness of its electrical equipment. Electricity should be like a willing servant, hidden in the walls of each room, waiting to serve. It will light you, warm you, heat water for you, and cook for you, besides doing a hundred odd jobs which were

formerly done by hand. Indeed in a discussion of this character one is forced to keep repeating those magic words, "electric" and "automatic." They hold the secret of efficient modern housekeeping just as they hold the secret of efficient

modern industry. But she who would incorporate these serviceable aids in her home most effectively should begin to place them, mentally, long before the corner stone of the dwelling is laid.

The various devices and equipment for different tasks are considered in the following paragraphs, arranged under the heading of the part of the house where the devices are employed.

#### IN THE BASEMENT

The basement of a modern house may be either an excellent example of domestic engineering, neat and efficient, or a dreary hodgepodge never entered except with misgivings. No part of the house rewards foresight so directly, yet basements are usually skimped. Painfully often this results in heavy expenditures later, because foundations are notoriously hard to change. The number and location of basement windows and their adaption to specialized service may spell the difference between light and gloom, good air and bad.

Laundry Equipment. — A basement laundry needs air and light almost as much as it needs soap and water. This is the last place to be equipped with up-to-date furnishings, and in no other place have they more marked influence on saving time and strength than here.

GRADE LINE COAL CHUTE

The question of washing machines is interesting to all housekeepers. There are several types, pressure-and-suction or rotary-and-oscillating being the most familiar. Rotary machines revolve the clothes in soap and water, while those of the oscillating type swing their contents back and forth and force the sudsy water through them. There are several models of each type which give satisfaction. These machines usually have power wringers included, which must be remembered in figuring the initial cost. There is no better investment than a washing machine for

smoothing the domestic economy, and the housewife who has once had one will never again be without it.

After the clothes are washed you may dry them without hanging them out, if you wish. Especially in city houses,

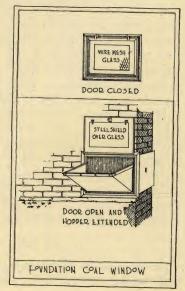
where yards are dark and soot and dust are flying about, this is an admirable method. There are various ways of doing this. There is the cabinet dryer, which has sliding racks on which the clothes are hung; then these are pushed into the heated compartment, where they dry quickly. There are also electric dryers which whirl the clothes around by centrifugal force, drying a large batch each six minutes. This is motor-driven at 2200 revolutions a minute. In fewer minutes than it takes to get out the clothesline the washing is ready to iron.

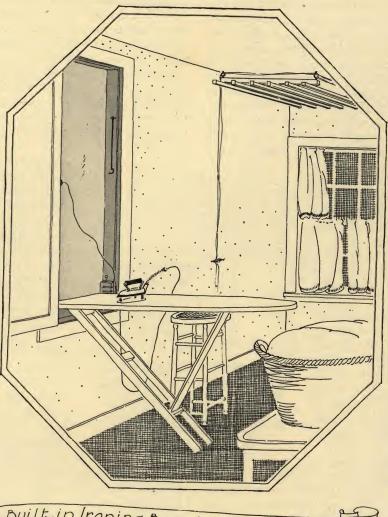
Indoor drying may also be done on overhead racks, which are easily used in any space where eight feet of ceiling room can be given to them. The rack is lowered by pulleys, the clothes are put on it, and the rack is raised into place. This contrivance is easily attached to any ceiling, as no special construction is required; the rack will remain level at all times.

Every up-to-date laundry is now equipped with an electric flatiron, and

more laundries every day are adding also an electric ironer. As this piece of apparatus can now be obtained as small as 24" x 37½", lack of space can in but few instances be an objection to its use. The newer household types will iron not only flat pieces but others as well.

Storage. - The basement is not only the power-andheat plant of the house; it is also the chief storage space for fuel, food, and tools. Each of these should have special consideration. If the heating plant burns oil, of course there is the problem of deciding upon adequate tankage, either inside or out, and locating the tank with relation to both ease of flow and refilling. Coal heaters have been so vastly improved that, if proper ash-receptacles are available, they can be operated with next to none of the dust and dirt that distressed the good housekeepers





Built-in Ironing Doard and Overhead Dryer

of the last generation. Especially is this the case if an easy way of getting ashes out of the basement has been provided.

But coal is always something of a nuisance unless due preparations are made for its entry. Iron-frame windows of wire glass can now be secured that have the double advantage of preserving the glass from breakage and of being burglarproof. With chains and pulleys they can be closed and opened either from the floor above or from some point in the basement, which relieves one from the necessity of clambering over full bins. Chutes and dust-proof bins now make it entirely possible to lay out a coal cellar that will give the householder as little trouble as any other part of the house.

It goes without saying that the housemother will insist upon plentiful shelving for canned goods in a dry, wellventilated part of the basement. The thrifty one will also

insist upon quarters being prepared for

root vegetables.

Other items to be taken into account in basement-planning include cisterns and pumps for rainwater, a water-softening machine if city water be unduly hard as it is in many localities, a garbage incinerator, a dustbin for a built-in vacuum cleaner if this type is used, laundry chute, and dumb waiter.

Garbage Disposal. — Incineration is the modern approved method of solving the problem of garbage elimination. There are two types of incinerators. The compact handy type uses gas as a fuel. This incinerator is placed either in the kitchen or in the basement. Garbage is deposited for a day or two, then the gas is turned on and in a short time the garbage is reduced to ashes.

The other type of incinerator is the socalled flue-fed type which consists of a brick incinerator in the basement with doors to receive garbage and waste from the flue on the floors above. This type handles all kinds of household waste and rubbish, tin cans, bottles, garbage, sweepings, newspapers, and all the general refuse that constantly is accumulating in the home. This type of incinerator does not require any commercial fuel, the dry refuse which is deposited being sufficient to dry out and ultimately consume the wet waste and garbage. It must be installed while the house is being built.

If you do not incinerate you should, at least, use an underground garbage-receiver. This consists of a neat cement base, built in with the top level with the ground. A lever on the side enables the user to raise the cover with a touch of the foot, and the garbage is placed in the container, which is so well protected that it is safe against being overturned or explored by nocturnal visitors.

Vacuum Cleaners. — These are to-day household necessities. They clean a house with a minimum of effort. Rugs, upholstery, and draperies may be kept free from dust and dirt in half the time formerly required. Experience has evolved special attachments, fitting into swivel handles, which make it easy to get under the furniture, behind the radiators, into the crevices of the upholstery, and other outof-the-way nooks. The dirt thus collected is retained in a bag or, if a built-in system is installed, is whisked down through a flexible tube into a container in the basement.

#### IN THE KITCHEN

In the kitchen also much can be gained by concentrating on its arrangements long before the room itself has

materialized. The keystone of this layout is, of course, the

Cooking Equipment. — If the range is gas or electric it has definite connections with the outside world and cannot be shifted about at will any more than the coal- or wood-range which is eternally linked with a chimney. Considerations of safety and economy, as well as of convenience, dictate that special attention be paid to the location of this central feature of the domestic laboratory and manufactory. All the other elements in a modern kitchen bear more or less relation to the range and can be placed with reference to its easy operation. But since shelving and spacing depend upon doors and windows, the housewife should have a complete mental picture of her kitchen before approving the architect's drawings for that corner of the house.

> With their many new improvements modern gas stoves give little excuse for poor cookery. They have automatic lighters, fireless-cooker attachments, automatically regulated ovens, broiler chambers, plate-warmers, and various other aids which eliminate chance and reduce labor and consumption of fuel.

> Electric ranges are becoming more and more common, especially in small apartments in those cities which enjoy cheap current. The value of electric cookery lies in the saving of labor, in cleanliness and comfort, and in food conservation. When you order an electric stove you must give the voltage of your electric current. Its installation requires special wiring, as the ordinary light-socket or plug will not serve. By turning off the current at the right moment, and using utensils of proper size, fuel bills may be kept down. Perhaps

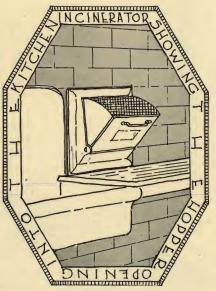
one of the best features of the electric stove is an automatic cut-out, which eliminates all possibility of burning or over-

doing food.

Kitchenettes can have small electric plates on which an astonishing amount of cooking may be easily done. With an electric table-stove you may cook eggs, broil, make toast or waffles, or cook on the griddle. You may have as many as three things cooking at the same time, so that with the addition of a coffee percolator the preparation of breakfast is only a matter of minutes. There is also a new electric cooker, in effect a small oven, which can be attached to a lamp socket. This comes in two sizes, with one and two compartments, 16" wide, 19" long, 30" high, and 32" wide, 19" long, 30" high, respectively.

Motors. - Electric conveniences in the kitchen include ventilators which will remove all odor of cooking, and keep the air fresh and pure even in the hottest weather. The opening for this ventilator is another reason to anticipate the carpenters and masons. An electric motor will do a hundred odd jobs quickly and with no effort beyond turning on the current, providing one has the requisite mechanism. Among these activities may be counted beating of eggs, mixing bread and cake-batters, grinding coffee, chopping ice, making ice cream, chopping meat, sharpening knives, polishing silver, and many routine tasks.

Dishwashers. - These in various models save the housekeeper long hours which used to be spent in a disagreeable task. There are many varieties operating on different principles. A prospective purchaser should make a thorough investigation before deciding which to buy. The shape will be chosen according to the space you have to give to the

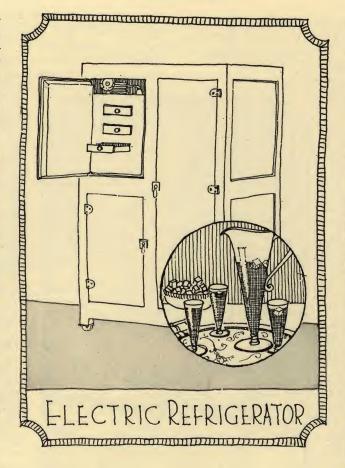


machine: it may be round or rectangular, portable or stationary, or it may be a fairly simple device which connects with your hot-water faucet. Plenty of hot water is the key to good dishwashing with a machine as well as by hand. Scalding water leaves the dishes hygienically clean and sterile. In making your choice be sure to get a model which has strong racks to hold the dishes so that they will not be easily broken, and find out by actual demonstration whether the water is forced against the dishes hard enough to remove all traces of food. Do not choose the model which runs with the least water, as it soon becomes unfit to use. Plenty of boiling water is the sligan for good work with a dishwasher. Another thing to have in mind is the washing of the dishwasher itself. What use is a machine which makes you spend as much time in keeping it clean as you would ordinarily spend on the dishes?

You will also have to choose between the type of machine which can be moved from place to place and the stationary kind which is attached to one of your sinks. One excellent type may be incorporated in a porcelain sink. Its sunk container holds the rack full of dishes, and the boiling water is forced over them through a hose connected with the hot-water faucet. You may also connect it with a cylinder which holds soap powder, so that soapy water is forced over the dishes until you are ready to rinse them. Then the soap is disconnected, and a stream of boiling water finishes the work.

Another type holds the dishes firmly in a rack under a cover, while hot water is forced over them from two nozzles which sweep water forward and back at high velocity. This model is said to wash a large number of dishes in thirty seconds: twenty-five for washing, and five for rinsing.

Fireless Cookers. — There are many types of these on the market, all of which save time, strength, and money. Some gas stoves have a fireless-cooker attachment, which permits the cook to start a dish on one of the burners, after which it can





be completed under a fireless hood without further watching. There is even an automatic fireless-cooker equipped with a clocklike attachment which the cook may set, and which shuts off the heat at any desired time.

Kitchen Cabinets. — After the cooking and dishwashing arrangements are perfected, the next step is to install that everbeloved convenience, the kitchen cabinet. This was the first invention on the market which proclaimed that modern inventors were beginning to put their minds on woman's endless work. It has been highly popular from the start and deservedly so, since it saves the housekeeper of to-day so many of her grandmother's laborious hours.

The present models of kitchen cabinets are marvels of condensed convenience. In them may be kept the essential groceries, cooking utensils, flavorings, and mixing implements, so that the cook has all her ingredients and implements at hand, and may prepare her meals without taking unnecessary steps. There are all sorts of clever arrangements, including devices for holding the cookbook open, and places for keeping milk tickets, and many other contrivances which eliminate much of the weary icebox-pantry-workbench-pantry-icebox travel of former days.

Suites of kitchen units may be bought, either of the detachable type or ready to build in. One may begin with one simple cabinet and add pieces until the entire available wall-space of the kitchen is covered by them. They may be combined in different ways, and there is no neater, more compact way to equip the kitchen than by the use of these units, which include, in addition to the usual equipment, all manner of shelving, closet space, even a breakfast nook.

Refrigerators. — The modern refrigerator is built on scientific principles and is designed to meet three definite requirements: the circulation of cold, dry air, effective insulation, and airtight construction. Interior walls may be of opaque glass with floors of tile, of porcelain, of baked enamel, of specially selected odorless wood, or of zinc.

Shelves of wire mesh are preferable, and a trap properly sealed to prevent the passage of warm air into the box is essential. An outside icing-door — when the box can be placed against an outside wall — is worth the expense, as it keeps the iceman from the kitchen. Some ice boxes have a coil of pipes

in the ice compartment for a continuous supply of ice water.

Electric refrigerating machines that can be placed in any standard make of refrigerator are one of the paramount improvements of the modern home, and should be considered when equipping the kitchen. They consist of two units, one placed in the ice compartment of the refrigerator and the other below the ice box or in the basement. Any good refrigerator can be fitted out with this equipment. Food placed in a refrigerator so cooled is kept at just the right degree of cold, and as the air therein is dry, it will keep without spoiling a longer time than in an ice-cooled box. Ice cubes just right for table use are always available, and these may be from any water you choose for that purpose. This removes one's oftentimes uncertain feeling about the purity of the ice which appears on the table or in cold drinks. Desserts may also be frozen by the same easy method. Standard makes have an automatic control that maintains an even temperature of a specified degree.

Ironing Boards. - In an apartment or small house where the laundry work is done in the kitchen a built-in ironing board is almost a necessity, and even in roomier quarters it will be found advantageous. Neat and ever-ready, yet out of the way, it should be installed in

a good light and have an electric utility attachment near it for the electric iron.

Plate-Warmers. - A convenience which many housekeepers enjoy is an electric plate- and food-warmer. This appliance comes in different sizes, but the one commonly in use in households is of a medium size, which may also be placed in the butler's pantry, where it will be found particularly helpful. In fact, it may be connected wherever there is a light-socket conveniently located near the place of serving food. This heater is commonly made with two possible degrees of heat, very hot, or warm enough to keep plates and dishes of the proper temperature until needed. In non-housekeeping apartments, where most of the food is brought in cooked, such a warmer is indispensable.

#### IN THE BREAKFAST-ROOM

In these days of scarce and high-priced servants, a small breakfast-room off the kitchen will be found extremely useful. In it can be served not only breakfasts but informal luncheons and children's meals as well. The tables and benches used at mealtime may be attached to the walls by hinges and folded back the rest of the day, permitting the room to be used as a maid's sitting-room or a sewing-room. Where limitations of space make further condensation an

object, these outfits can be installed in one end of a livingroom and concealed behind curtains or French doors when not in use. A popular table for this use seats four persons comfortably and has strong supports which lock into place when the table is swung into the upright position. Built-in "dining-nooks" change a corner of

the kitchen into a miniature dining-

room.

#### IN THE BEDROOM

Built-in beds are a convenience in the very small apartment or bungalow. It is possible by their use to turn a living-room, sleepingporch, nursery, library, or den into a bedroom at a moment's notice. If desired, these beds can be equipped with box springs and be fully as comfortable as any others. After being made up they are folded back into the closet provided for them, a touch being all that is necessary.

#### MISCELLANEOUS "BUILT-INS"

In addition to those already considered there is a large and growing category of "built-ins" that should receive attention. These should either be constructed or have proper space left for them while the walls are rising, since they cannot be improvised afterward without inconvenience, noise, dust, and wholly unnecessary expense. Of course plumbing, drains, and electric wiring are common matters for provision; but how rarely are houseowners entirely satisfied in these regards after a year of occupancy? Forethought would save many a regret and many an alteration charge. Especially is this true of electric wiring, because electrically operated

devices increase so rapidly that there rarely seem to be enough plugs for all one's purposes. During construction, too, it will usually be found advantageous to build in mirrors, medicine cabinets, window seats, bookcases, china closets, and shelves. Then there is a whole array of bathroom accessories that can be let into the walls: towel racks, spongeand paper-holders, safety grips for young and old, spaces for soap and wash-cloths. Even scales may be rendered inconspicuous by being recessed into the wall and having the platform sunk into the floor. Here, too, the multiplicity of electrical devices should weigh in favor of ample plug spaces to accommodate electric curling-irons, hair-dryers, and an immersion water-heater. The last word in bathroom luxury is an electric radiator for instantaneous bathroom heat, with racks near by on which towels may be warmed.

The built-in ironing board has already been mentioned as a convenience for laundry and kitchen. In the bathroom too it will be found a desirable adjunct for personal use.

Among the simple conveniences that may be added more inexpensively while building than later, are package boxes with openings both within and without the house. In these boxes deliveries are safe until drawn inside. An advantage at all times, this arrangement solves a problem highly vexing to families whose members are away from home much of the day. Along this same line is a steel meter-box which can be

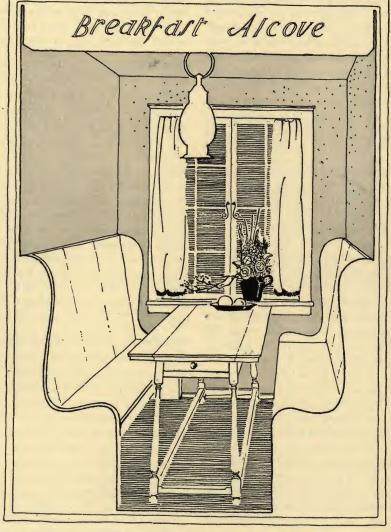
read from outside, thus forestalling one unnecessary interruption of the domestic routine. Mail boxes built between the inner and outer walls are both safer and neater than the standard iron box (so often rusted a dirty red) that disfigures many an otherwise excellent doorway.

#### SOME RECENT NOVELTIES

Now that household work has been raised to the status of a profession and has focused the serious attention of manufacturers and inventors, new devices are each year put on the market to capture the attention of the home worker and to persuade her to purchase. In the large cities exhibitions are held for a display of such equipment and for demonstrations of its use. Some of the novelties recently seen which seem to merit consideration are mentioned here:-

A shower that can be attached to any bathtub and that contains a soap-box through which the

water circulates when soapy water is wanted. In the same box can be placed, instead of soap, bath salts, perfume tab-



lets, Epsom salts (claimed to be efficacious in reducing weight), or ice. This shower has a horizontal spray, so that no bathingcap is necessary.

A flue that can be placed on the vent of a gas cooking-range where there is no chimney-flue connection, which, it is claimed, will destroy all small particles of hot grease in the fumes from cooking, thus eliminating smoky, greasy walls.

For the living-room when there is no fireplace, a gas grate, which heats without odor and supplies something of the cheer of an open fire; also an electric grate for the same purpose. If the latter is to supply only cheer, it can be attached to any lighting circuit, but for heat it must have special installation.

A window lock which will hold fixed a window that is opened eight inches, thus giving a feeling of security to timid ground-floor sleepers.

A vacuum cleaner that has not only the common

brush attachment for rugs and carpets, but in addition a vacuum mop for hardwood and linoleum floors.

#### QUESTIONS AND ANSWERS

A number of typical inquiries made by prospective home-builders have been listed in this chapter, with the generalized and condensed answers which might be given by the architect or the contractor. Here, as in the preceding chapters, the matters discussed are principally the practical details of the contract and of construction, rather than the logic of planning or the æsthetics of design

Question. — Is it permissible to attempt to build from plans which appear in house-plan books and house magazines?

Answer. - Those plans are shown for the suggestions they may offer and not for imitation. As the plans thus shown are sketch plans and in no sense working drawings, they do not contain sufficient information to enable a contractor to duplicate them, even if this were desirable. Moreover, as the elevation drawings and details are not given, they must be supplied according to the fancy of the builder; and too much stress cannot be put upon the fact that a builder's fancy seldom measures up to an architect's conception. It is not the builder's province to design. His trade is to follow directions. And it is in the handling of such points as the spacing of windows, the type of chimney used, the scale and character of mouldings, of trim, doorways, mantels, and so on that a house is made or marred. To be sure, not all architects work from the highest standard, and the main purpose in showing photographs and plans of houses in the House Beautiful-Building Annual and the House Beautiful magazine is to show the character of the work that the best architects are doing.

Question. — Is it possible, then, to purchase from the architects the complete working drawings of houses which thus appear?

Answer. — As it is practically impossible for the requirements of one family to be identical with those of another, house plans cannot ideally be used a second time, and few architects will consent to it. Moreover, the lot chosen, the character of the surrounding houses, the tastes of the owner, and the furniture which he must use (few families start scot-free, without some acquired or inherited pieces) further modify the problem. It is better to take your problem to the architect whose work particularly appeals to you and let him design a house that will express your individuality, fit your lot, and conform to your neighborhood.

Question. — Must the home-builder who positively cannot afford the services of an architect fall back upon the builder's house?

Answer. — No. Architects, recognizing the existence of this problem, have endeavored to meet it by designing what are known as type houses. These are carefully planned, attrac-

tively designed small houses, adapted for flat lots and average family needs. They have real architectural merit, but of course they cannot have the individuality that a house will have when designed for a single client. Plans for such type houses can be obtained from the Architects' Small-House Service Bureau, with central headquarters at Minneapolis, or from the Home Builders' Service Bureau of the House Beautiful magazine.

Question. — What is the cause of efflorescence, or white patches which appear and disappear on brick walls? Can it be entirely removed?

Answer. — Efflorescence, or, as it is sometimes called, "white wash," may be due to the brick or to the mortar. If it is due to the brick it may be traced to its source. Test a brick by placing it in a pan containing an inch of pure water. If the brick contains the soluble salts which are the cause of the difficulty, white discolorations will appear after the brick has absorbed water. Very hard-burned bricks will not discolor under any circumstances, and the difficulty may be obviated in those bricks liable to it by the addition of barium carbonate to the clay. This, however, although it does assure the nonappearance of the discoloration, is an expensive process. Fortunately, in most cases this white wash will disappear in time, being washed away by the rains. Efflorescence is more commonly due to the mortar, and in this case is more difficult to overcome. It may be reduced by waterproofing the joints around the window sills and between the foundations and the walls, so that the absorption of moisture from rain and its rise from the ground are diminished. If about 2% of barium carbonate is added to the cement, the soluble salts contained therein are rendered insoluble and the cause of discoloration is thus removed. Where the efflorescence does appear it may usually be removed by washing the wall with rain water to which a slight amount of muriatic acid has been added, and following that by a washing with clear water.

Question. — Is it advisable to use secondhand brick for a new bouse?

Answer. — The soft-textured surface of a wall built of partially cleaned old brick has a picturesque quality that can be equaled only by the careful culling of expensive special new brick. If secondhand brick is available, especially if it is purchased as it is being removed from the demolished building and carried direct to the new site without rehandling, it may save from a quarter to a half of the purchase price of new material; but cleaning — that is, the removal of old mortar and dirt — will reduce this saving, especially if the mortar used was of a very hard variety. This reduction will be still further lessened by the breakage, which may be considerable, and by the fact that old brick is not so quickly laid up as the new.

Question. — Is it possible to keep the odors of the kitchen from the main part of the house when only one door intervenes?

Answer. — When there is only one partition between the kitchen and the hall, the door frame may be made to accommodate two doors swinging in opposite directions. This, however, is not so convenient an arrangement as the use of weatherstripping, which will make the door so tight that few odors can escape.

Question. — Is it a good plan to cover the ice in the ice chest with a blanket to retard its melting?

Answer. — No. Circulation, which is essential in the ice chest, is maintained by the cooled air immediately about the ice dropping to the bottom of the chest because of its increased weight, becoming then slightly warmer, and rising again, thus

maintaining a constant flow. The ice, in melting, absorbs heat. If this process is interfered with, the efficiency of the ice chest is lessened. It is more important to have a box that is well insulated and to keep the ice compartment full.

Question. — Is it true that moist air in the house is more healthful than dry? Is it desirable for other reasons, and what percentage of humidity should be maintained?

Answer. — Dry air is usually dusty air and dust is an irritant. Woodwork and furniture will contract and crack in an overdry atmosphere. Moreover, dry air must be of a higher temperature for comfort than moist air, so that if a proper relative humidity can be maintained it is claimed that a saving in fuel will result. Authorities differ as to the proper relative temperature and humidity, but a temperature of 70 degrees F. with a relative humidity of 40% is generally accepted at the present time. This denotes a moister air than is usually found in houses. The old way of placing a small water-pan at the side of the warm-air furnace is far from efficacious. Improved methods provide a pan with a large surface over the combustion chamber, filled automatically, or else means of moistening the incoming air in the cold-air chamber, or spraying the air as it leaves the furnace.

Question. — What is the best way to get rid of mice in houses? Answer. — The only sure way is to seal up the holes. In a house that is properly constructed firestopping will prevent the passage of vermin as well as of fire. If mice or rats have gained entrance to the house, their holes can be stopped up effectively by the use of mortar. Cover large openings with expanded metal lath or stout wire netting, plastered with a cement mortar made of cement, I to 2 parts of sand, and water in a sufficient quantity to make easy handling. The same mixture can be applied to holes in masonry after they have been brushed with a "grout" of cement and water mixed to the consistency of cream. When small holes in wood are to be filled, first drive in brads or nails in such a manner that they will be covered by the mortar and will hold it firmly when set.

Question. — Is asbestos paper a satisfactory covering for warmair pipe?

Answer. — No. The use of such paper either for insulation or for protection against fire is of no value. For this purpose cellular asbestos or a similar incombustible material should be used, at least ½ inch thick for the pipes and I inch for the furnace.

Question. — Is water-heating by electricity practicable?

Answer. — In a recent report by a committee organized by the National Electric Light Association, the statement is made that electric water-heating is a success on a meter rate of two cents per kilowatt hour.

Question. — Is it necessary to provide a drain for an electrically operated refrigerator?

Answer. — A drain is desirable to take care of the water formed by defrosting, that is, by the periodic turning-off of the current to allow the frost which forms on the tank to melt. Some manufacturers, however, provide for this purpose a large pan to be placed under the ice chest from which, they say, the water will take care of itself by evaporation.

Question. — How may I learn more about coöperative bousing?

Answer. — By addressing the Coöperative League at 167 West 12th Street, New York.

Question. — Is there any way to retard the setting of plaster when it is necessary to do so in order to trowel it properly?

Answer. — Yes, there is a retarder on the market which is a potent remedy for this difficulty. If there is not time to send for it, a little pulverized glue or molasses mixed with the batch will be effective.

Question. — Is it necessary to paint copper gutters and leaders either for protection or for the sake of appearance?

Answer. — No. Copper cannot rust and therefore does not need the protection afforded by paint. As copper will, on exposure, assume the well-known and desirable light-green patina associated with old work, it should be given an artificial finish only when an immediate color-effect is desired.

Question. — Is it essential to have a flue connection with a gas stove?

Answer. — While not essential, it is eminently desirable to have such a connection, and it is better to have an independent flue for this purpose rather than to connect to the flue used for the furnace or coal or wood stove. For the gas-fired water-heater a flue connection is imperative.

Question. — Is it true that there is danger of a lumber shortage in this country?

Answer. — The impression prevalent in some parts of the country, that the supply of wood is becoming so depleted that in the near future there will not be a sufficient supply for building purposes, is erroneous. There is still enough virgin timber to last for several generations. Moreover, with the growing practice of forestry, a certain supply will always be maintained, partly by increasing the yield of timber per acre and partly by checking the waste in the use of timber.

Question. — Is there any book published on the subject of building with rammed earth or pisé de terre?

Answer. — In Modern Pisé Building by Karl J. Ellington, which may be obtained from him at Port Angeles, Washington, is a short history of the use of this method of building and directions for its application to-day.

Question. — Will stucco adhere permanently to concrete masonry?

Answer. — Experience has proved that Portland cement stucco, properly proportioned and mixed, when placed on concrete masonry will form a bond so strong as to make practically a monolithic wall.

Question. — What is the difference between heartwood and sapwood?

Answer. — With most woods, the logs show an inner darker core, which is the heartwood, and an outer lighter layer, or sapwood. This difference in color, however, is not always pronounced, and in some woods, such as spruces, true firs, hemlock, cotton wood, tupelo, basswood, and holly, the heartwood is little if any darker than the sapwood. The heartwood is usually preferred, either because it is more durable under conditions favorable for decay or because it is more decorative. For certain purposes, however, as interior trim and flooring, the white sapwood of maple, ash, and yellow pine is preferred. In old trees that have passed their period of best growth, heartwood is stronger than sapwood, but in young trees the two are of about equal strength.

Question. — Will you give a brief list of books on Colonial Architecture?

Answer. — The following books, while not a complete list, will give a good survey of the architecture of the colonies.

Architecture of Colonial America, by H. O. Eberlein. Old Colonial Architecture and Furniture, by Frank E. Wallis. Measured Drawings of Some Colonial and Georgian Houses, by D. Millar.

Early Rhode Island Houses, by N. M. Isham and A. F. Brown.

Early Connecticut Houses, by the same authors.

Colonial Architecture of Maryland, Pennsylvania, and Virginia, by J. E. Chandler.

Details from Old New England Houses, by L. L. Howe and C. Fuller.

The Colonial House, by J. E. Chandler.

Question. — What is galvanized iron?

Answer. — The term galvanized iron is applied to any form of iron or steel coated with zinc. It is essential that the coating be adherent, continuous, free from pinholes or bare spots, and of a thickness which will stand bending without cracking or peeling. This zinc coating forms an excellent protection to iron, since iron will not rust so long as this zinc coating remains. It should also be painted for additional protection and for the sake of appearance.

#### SOME COMMON MISTAKES

Throughout this book the idea has been kept constantly in mind to present its information in a form concise enough to be easily read and retained in the memory, and yet sufficiently complete and detailed to save the house-builder from as many as possible of the pitfalls that yawn for the unwary. A few of the least-suspected ones are gathered together below for extra precaution

Plot Plan. — Perhaps the first mistake that is commonly made, after one has avoided the Scylla of attempting to build without architect's plans and the Charybdis of planning the house before the lot is selected, is that of placing the house on the lot before planning the location of the garage, gardens, and service yard. Unless a plot plan is made first, one is apt to find that his garage is where his garden should be, that there is n't sufficient space near the kitchen for drying the clothes, or that the kitchen, instead of the living-rooms, faces the garden. Such mistakes can be avoided only by a carefully developed landscape plan.

Grading. — An unfortunate mistake is often made through careless grading, which allows the accumulation of snow, ice, or water against the walls or entrance of a house or garage. A garage under a house is particularly subject to the annoyance of having ice interfere with the opening of the doors,

unless proper precautions are taken. The attractiveness of a house set low in the ground is made practical by careful attention to this detail of grading. Either grade away from the garage door into a runway, or put an iron grille just before the door, so the water cannot enter the garage — preferably the former.

Underdrainage. — The omission of underdrainage (that is, unglazed tile laid in sand below the cellar floor) will often cause the floor to crack and buckle, unless the situation of the house is unusually well drained, and the soil is of sand rather than clay. Place an agricultural-tile drain leading to an outlet above the footing, outside of the wall, and waterproof or use damp-proof paint for walls and floor.

Weep holes. — In any wall or surface against the back of which moisture may accumulate, it is a mistake not to provide weep-holes, or holes through which the water may drain.

#### APPENDIX

Local Conditions. — It is a common mistake to see a house built well and economically of a certain material in one locality and to wish to duplicate it elsewhere with the same effect and at the same cost. It should be remembered, however, that the material which is inexpensive in one locality must usually be transported at substantial cost to the other locality, and that the kind of labor available may vary just as much. For individuality as well as economy, work out your independent designs in your own local materials and with regard for prevailing market conditions. Also, fit your material to the design. Don't build a beautiful Colonial design meant for wide shingles in skintled brickwork, although the latter is charming if used properly.

Contract or Day's Work. — For a house-owner unaccustomed to market conditions and to labor and architectural plans, or one unable to give much time to supervision, it is usually a mistake to prosecute the work without a contractor. The saving of a contractor's overhead charges may seem attractive, but it is generally spent twice over on mistakes and overcharges.

Concrete. - Concrete must be used properly to give firstclass results. Possible mistakes in its use are: Lack of proper reënforcement for the existing stresses; poor proportion of ingredients in mixing; insufficient curing or hardening before being put to use; erection in severely cold weather without protection; inattention to specifications by the contractor. These mistakes can be easily avoided, for the fault in such cases lies not with the material but with the treatment of it.

Furring of Masonry. - In most climates and with most masonry materials it is a mistake to omit furring - that is, nailing on wooden strips twelve to sixteen inches apart, and lathing on them. In the best practice these are nailed to wooden studs on the interior of the masonry wall. The air space provided by furring keeps dampness and cold from penetrating the house and also prevents condensation. Unless the wall itself contains an air space, or the climate is unusually favorable, the economy of omitting the furring is offset by subsequent charges for heating or for repairing walls stained by moisture.

Shrinkage. — Use of insufficiently dried lumber is shown by cracks, due to shrinkage after building as the wood dries out. Even when well-dried lumber is used there will be some shrinkage, and an important precaution against this should be taken by equalizing in the outer and inner walls the amount of horizontal framing members appearing in cross section. For instance, a bad framing in this respect might show a stud in the outer wall resting upon a sill only 31/2 inches thick, while the interior wall stud might, in an extreme case, rest upon a plate placed on the under floor, resting upon a 12" joist, which in turn is supported by 4 x 6 girder, so that we should have, against the 31/2 inch of shrinkable wood in the outer wall, approximately 20" on the interior wall.

Safety against Fire. — The building of houses which are to accommodate more than one family should properly be safeguarded at least by fire walls between the dwellings. It is unwise to jeopardize the safety of one family by the possible carelessness of another. The question of preliminary expense seems of secondary importance to the result. In a two-family house expanded metal lath and gypsum plaster may be used to good effect for a fire wall. In many districts the fire protection is required by law and the materials to be used are specified.

#### SOME CONVENIENT MEASUREMENTS

The information given below has been gathered together from many sources for ready reference. As it is our desire to make this list as helpful as possible, we welcome any suggestions or additions that will make it more complete

#### Kitchen and Laundry

Height of sink from floor to top of rim, 36" to 38" or to housewife's elbow

Height of counter or table for mixing, from floor, 2' 10"

Height of first shelf from kitchen counter, 16"

Height of lavatory from floor, 34"

Height of laundry trays, from floor to top of rim, 36"

Height of built-in ironing board, from floor, 33" to 35" Electric ironer, small size, 24" x 371/2"; average size, 25" x 54"

Dish-washing machine, 2' 4" square

Clothes-washing machine, round, small size, 2' 21/2" in diameter; average size 25" deep x 28" wide

#### Lights and Lighting Fixtures

Height of drop light from dining-room table, 24" to bottom

Height of ceiling light over dresser, 6' from floor, 13" out from wall

#### Closets

Minimum depth of clothes-closet, 22" to 26". (26" allows room for a row of hooks at back of closet and for pole) Diameter of pole in clothes-closet, 11/2" to 2", depending on span. (Pole over 2" does not take clothes-hanger easily) Vertical distance between shelf and pole, 3"

#### Furniture Sizes

Single bed, 3' x 6' 4" Three-quarters bed, 4' x 6' 4" Double bed, 4' 6" x 6' 4"

Average bureau, 18" to 22" deep x 38" to 40" long
Upright piano, 4' 10" to 5' 6" long; from 4' to 4' 9" high
x 2' 4" deep

Miniature baby grand piano, from 5' 10" to 6' long x 4' 10"

Parlor grand piano, from 5' 6" to 6' 10" long x 4' 10" wide

#### General

Smallest door-opening to accommodate the passage of furniture, 2' 6"

Clear height on front stairs above front edge of steps, 7' 6" for looks or 7' for clearance; 6' 6" is minimum

Clear height for cellar stairs, above front edge of steps, 6' Depth of bookshelves, 8" to 9" a good average

Cubic feet required for 1 ton of coal, 40

#### Garage and Drive

One-car garage, minimum, 10' x 18' Two-car garage, 20' wide x 22' 6" long Garage door, 8' wide, 8' 6" high Turn-around, minimum radius to outer edge of drive; for Ford, 14'; for Pierce-Arrow, 30' 6" Minimum depth of Y-turn, 14 Over-all length of Ford, 11' 6" Over-all length of Pierce-Arrow, 18' 3" Tread of Ford, 4' 8" Tread of Pierce-Arrow, 5' 9" Minimum width of drive, for single car, 8', for two cars, 15' Minimum width of runway, 4' 8" centre line to centre line

### QUESTIONS I HAVE NOT FOUND ANSWERS FOR IN THIS VOLUME

Write below the questions which ar Tear out this sheet, or if you prefer, of Annual Editor, 8 Arlington Street, Bo answered in the Building Annual for this purpose, a complimentary copy of	rose in your mind as you copy the questions on a ston, before March 1, 1927. To all those from the new 1927 edition	u read this book, to another sheet, sign a 1926. Many of the om whose questions will be sent.	which you do not find nd mail to the House ese questions will be one or more may be	l an answer. e Beautiful printed and chosen for
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### ACCOUNTING SHEETS FOR PROGRESS OF WORK AND PAYMENTS

Note: These sheets have been prepared for convenient records of the progress and expenses of building. On this page you may keep a concise diary of operations from day to day, or week to week. On the two following pages may be kept a record of payments to the contractor and an itemized memorandum of the contract figures. On the last page of this insert may be kept a record of payments to the architect. For a discussion of the architect's charges see page 3.

#### PROGRESS OF WORK

Date	New Work to Date	
	TONE TO DATE	QUESTIONS TO TAKE UP WITH ARCHITECT
		* *
		The second second

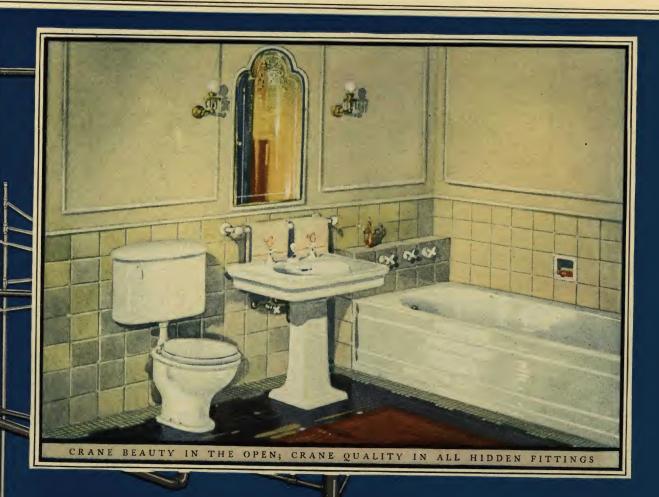
#### ACCOUNTING SHEETS

#### RECORD OF PAYMENTS TO ARCHITECT

FEE OF% ON CONTRACT PRICE OF \$;	\$
Additional Fee	\$
Total	

Date	Payments	Against Fee	Traveling Expenses
	One fifth total fee, upon completion of sketches		1
	Two fifths total fee, upon completion of working drawings		1247)
	Payment on work completed to date		
	Payment on work completed to date		7==1
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×	Payment on work completed to date		
	Payment on work completed to date		•
	Payment on work completed to date		
	Payment on work completed to date		7 1 1
*	Payment on work completed to date		
	Final payment		
	Totals		

Final amount of contract			\$
Fee of% on above			\$
Amount paid on fee		. *	\$
Amount due as final payment			\$



Beauty, comfort and property values far greater than the money cost, have been added to countless old and new houses by installing in each an extra bathroom.

No large amount of space is required. An empty hall-end or a large clothes closet can be transformed at moderate expense into a bathroom modern, complete convenient and charming. A broad range of Crane fixtures has been de-

signed to economize room, yet provide faultless service. The *Corwith* bath of cream-white enamel on iron, pictured above, may be had in four lengths; the *Nova* lavatory in three sizes.

Any responsible plumbing contractor will help you find a place for your extra bathroom and will supply Crane fixtures in styles and sizes to suit your taste and budget. Write for helpful free color book on bathroom arrangement.

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Many homes use "Creo-Dirr" Stained Shingles not only for roofs but side walls as well, either in the regular 16 or 18 inch length or the wide exposure 24 inch length for beautiful Colonial effect. Age only improves the beauty of "Creo-Dirr" Stained Shingles. These are selec-

ted, Edg-Grain British Columbia shingles, colored and preserved against weathering by pure earth pigments and linseed oil carried into the fibres of the wood with creosote.

For complete information in regard to "CREO-DIPT" Thatch Roofs, send for complete details and working drawings. Enclose 6c in postage for special book of "CREO-DIPT" Thatch Roofs. For the use of regular 16-, 18- and 24-inch lengths of "CREO-DIPT" Stained Shingles for both roofs and side-walls in thirty shades, send 6c in postage for color pad and Portfolio of Fifty Large Photographs of homes of all sizes by Noted Architects. Address CREO-DIPT COMPANY, INC., General Offices, 1020 Oliver Street, North Tonawanda, N. Y.



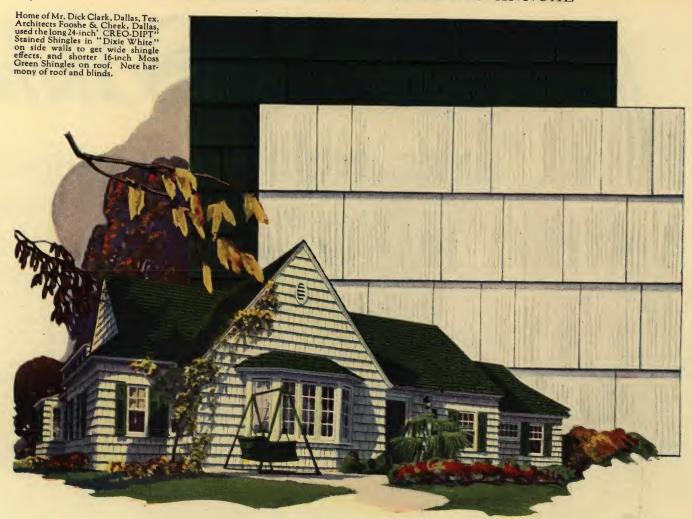
Send 6c in postage for sample color pad and this Portfolio of Fifty Large Photographs of Homes of all sizes by Noted Architects.

Factories at North Tonawanda, N. Y., St. Paul, Minn., and Kansas City, Mo. Sales Offices—Principal Cities. Leading lumber dealers everywhere carry standard colors in stock.

"CREO-DIPT" stamped upon Every Bundle Binder Indicates Highest Quality.

### "CREO-DIPT" Stained Shingles





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ORE than a house, more than a place to live, more even than a thing of beauty—is home. It is part of oneself, growing dearer as the years go by, gathering about itself the memories of love and friendship, adding continually to its freshness the charm of time.

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either with wide or narrow shingle effects lend a charm impossible with any other building material.

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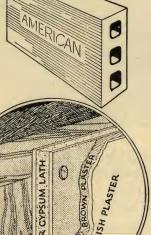


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# BEAVER AMERICAN PLASTER 100 LISS BLY WILGHT

Beaver American Plaster, recommended by most reputable builders, because of its exceptionally uniform and easy working qualities and because of the strong, durable wall it may be depended upon to build.

Beaver Gypsum Block, for fireproof partitions. Manufactured by the latest improved equipment. Uniform in dimensions. Of exceptional strength.



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RIGHT in your block you will find the striking contrast between good construction and bad. There is the building that has become a monument to well chosen building materials . . . and there is the building that time has marked for endless repairs—heavy depreciation.

You know the latter type of building. It is the building with the unsightly cracked walls, the leaky roof, the sprung woodwork. It stands as a solemn warning to anyone who is about to build or remodel. Its message is clear cut. You should know building materials well before you spend a cent for any construction.

We do not ask you to choose Beaver Products on their remarkable record alone — or even upon the recommendation of the hundreds of home and building owners whom they have served so well. We simply say, test and compare them.

For walls, there is a wide range of Beaver Products — plaster — fibre wall board — plaster wall board — gypsum lath — gypsum blocks. Each of these materials is a pioneer in its field — each will be found to possess a little more strength, adaptability and decorative possibilities. Know these products before you spend a cent for wall materials.

For roofs, there is always a Beaver Product that gives greater protection, better appearance, and greater ultimate economy. Made of better felt and asphalt, Beaver Vulcanite shingles and roll roofings have shown their ability to invariably withstand the destructive forces that prey on roofs.

Build well. A little time—a little thought—right now, will mean a world of satisfaction later on. The coupon will bring a description and sample of any of the established Beaver Products that are briefly described in these pages. Test them. Compare them.

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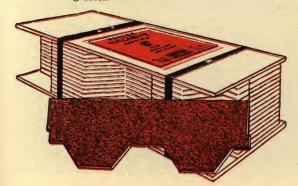
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The Vine-clad Homes of Kohler

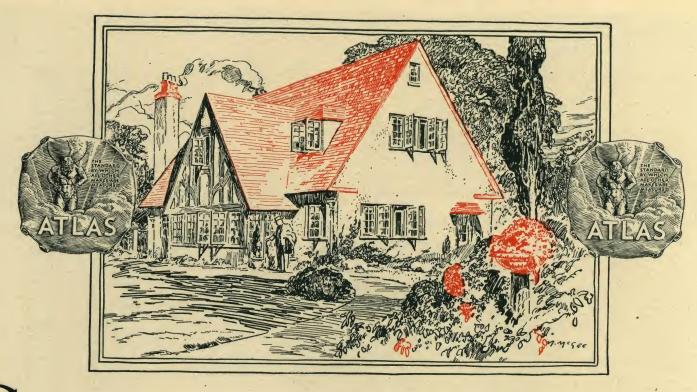
Beautiful amid their vines and flowers, the homes of Kohler Village are as noteworthy as the quality of Kohler products—enameled plumbing ware and private electric plants

HERE'S many a ship that goes to sea in a tub of Kohler Ware. And there's many a sailor lad who grows up on good terms with fresh water—and soap, too—thanks to bathrooms made inviting by those fine fixtures which bear the name "Kohler" fused in faint blue letters into snowy enamel. . . . You should have Kohler Ware in your bathrooms; in kitchen and laundry, too. It is distinguished ware, but no more expensive than any other that you would care to consider. Write for Booklet E.

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# Concrete, made with Atlas, supplies with economy all that is necessary for Construction and Decoration

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ASTERPIECES in modern architecture and sculpture are now being produced with a modern material at less than one quarter the cost old-time materials

would make necessary.

The Shrine of the Sacred Heart at Washington, D. C.; the Parthenon at Nashville; the Fountain of Time in Chicago—all have been produced through a new technique in concrete made with Atlas Portland Cement.

And the same quality that made Atlas the preferred Portland Cement for these note-worthy achievements makes it equally desirable for the home, industrial buildings and all other types of modern construction.

In most localities the house of concrete blocks overcoated with stucco made with Atlas costs only about 2% more than one of ordinary frame construction. Such a house is fire-safe — beautiful — economical and permanent.

The architect, the contractor, the home-builder, have now available in concrete made with Atlas Portland Cement, either in its normal gray color or in pure white, the complete architectural medium, for it embodies in itself all that is necessary for construction and decoration—another reason why Atlas is known as "the Standard by which all other makes are measured."

Between the Atlas plants and the user there is but one distributor—the building material dealer—who brings Atlas to the public cheaper than by any other method. Any architect, contractor or prospective builder is invited to write this Company regarding the possibilities of concrete, made with Atlas.

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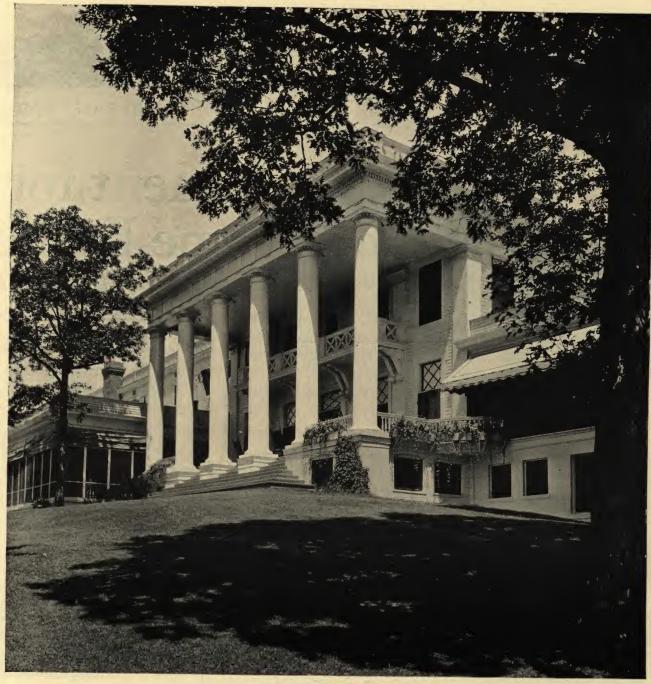
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Painted with

### 40-40-20\*, A WHITE PAINT THAT STAYS WHITE

HETHER the setting be the cool green of well kept lawns or the sunny shores by the restless sea, whether the structure be a palatial country club or an idle-hour cottage, an exterior finish of brilliant white paint enhances its charm.

40-40-20\*, a development of progressive paint research, is a formula perfected by The New Jersey Zinc Company after years of tests. The use of 40-40-20\* paint will insure that a white house stays white.

Pigments, inerts and vehicles chosen for their desirable properties are combined in their most efficient proportions in this formula. 40-40-20\* means 40% "XX" Zinc Oxide, 40% "Albalith" (super-lithopone)

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Leading paint manufacturers, licensed by The New Jersey Zinc Company, are making 40-40-20\* paint. It is in all respects equal, and in some respects superior to other high-grade paints, and it is no more expensive.

> The little booklet entitled "40-40-20" gives full information. We will be glad to send it to you. Write to The New Jersey Zinc Company, Dept. H.B.B., 160 Front Street, New York City.

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# A Movement for Honest Home Building of vital interest to all who Plan to Build or Buy

THOSE who know the truth about modern home building, know that a revolution began with the housing shortage of war and post-war days. Any sort of house would sell. The result was an inrush of inferior workmanship and materials. The good builder was help less to prevent it, and the public could not protect itself.

The home building industry is still sound at heart. Its age-old ideals are not easily destroyed. The products of most home builders are still honest products—safe to buy if you can recognize them. A great national Association has now made this possible—by developing the Safeguard Policy.

## The Safeguard Policy

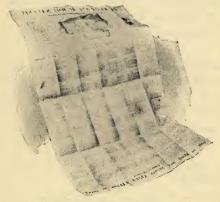
Guide to Safe Home Owning

THE fundamental trouble was that the average man or woman, unskilled in the complex mysteries of modern home construction, could not tell a good house from a poor one. The members of this Association knew that there could be no real betterment in the building industry till this condition was overcome.

So they created the Master House Department—an organization of material and construction experts. To these men they gave one single command:

"Create a means whereby anyone, no matter how unfamiliar he is with home building principles, can know exactly what materials and workmanship have gone into the home he builds or buys—and can thus know what he pays for."

That means is the SAFEGUARD POLICY—now available to you after three years' development. It is being distributed through the leading building supply dealers who are members of this Association—as a non-profit service to home planners, builders and buyers. It will protect you before and when you build or buy.



MASTER HOUSE STANDARDS

Compact KNOWLEDGE about the 53 Vital Points by which you can tell a good house from a poor one.

(2)—SWORN FACTS
The Two Steps to Safe Home Owning
The Safeguard Policy protects were in the safeguard Policy protects.

The Safeguard Policy protects you in two simple, logical ways—for it provides;

(1) - KNOWLEDGE

(1)—KNOWLEDGE of home construction principles—before you build or buy. It contains compact, clear, authoritative information on the 53 Vital Points by which you can tell a good house from a poor one. Your first step in planning a home should be the study of these.

(2)—SWORN FACTS about the individual house—when you build or buy. The Safeguard Policy is filled in by builder, contractor, architect or realty man—and sworn to before a Notary. It then reveals, in detail, the actual Materials and Workmanship used in the 53 Vital Points.



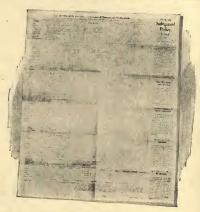
The Building Supply Dealer Unites All—Serves All

He is an impartial source of expert information on building materials, sound construction methods and values. He will give you competent counsel on the planning, financing, building or buying of your home.

He will assist you in the selection of a capable architect or contractor.

He is the vital connecting link between all those working in the cause of better building—the manufacturer, architect, banker, builder, contractor and public—serving all.

Your Building Supply Dealer is a Good Man to Know



CONSTRUCTION CHART
For a record of SWORN FACTS about the materials and workmanship actually used in the 53 Vital Points



Which will you Build or Buy?



## NOW — You Can Know What You Pay For

TILL now you had no means of comparing the real character and value of two houses.

As far as you could see—which was only the Surface—they might seem to be worth about the same price.

Yet what was in those most important parts beneath their surfaces—under the floors, behind the walls—down in the hidden foundations. There were a myriad secrets you could not know—till you had built or bought the house and lived in it. Then it was too late to save yourself from loss and disappointment,

The builder of one house may have been an honest builder—who put sound workmanship and materials into every hidden part.

The builder of the other house may have built for surface appearance only.

The honest builder has nothing but his unsupported word, to convince you that you should buy his house instead of the other—unless he has made a Safeguard Policy record of materials and workmanship.

But, if he has made such a record, signed and sworn to before a Notary—he can prove and you can see—exactly what you pay for.

Everyone who Plans to Build or Buy Should Have This Safeguard Now

The 53 Vital Points of home construction should be known to you, long before you actually build or buy. Take the first step toward safe home owning by obtaining a Safeguard Policy now, and studying its MASTER HOUSE STANDARDS.

If you are now about to build or buy, ask the man who builds or sells the house for a Safeguard Policy record of materials and workmanship—with CONSTRUCTION CHART fully filled in, signed and sworn to before a Notary. The good builder is glad to do this for you.

Remember that two dollars is the standard price for the Policy—whether you secure it through your local building supply dealer —or direct from the Master House Department at Cleveland.

Remember, too, that by purchasing a Safeguard Policy you are sharing in this movement for honest home building. You are aiding in the creation of a fund which will tell more home planners about this guide to safe home owning.



Send 10c for THIS BOOK

It tells the whole story of Safeguard Policy protection—also gives valuable information about the problems of home buying and building—from the lot to the finished home.

### THE NATIONAL BUILDERS' SUPPLY ASSOCIATION

MASTER HOUSE DEPARTMENT

Guarantee Title Building, Cleveland

A Non-profit Organization for the Promotion of Honest Home Building

### Why all interested in Better Home Building welcome the Safeguard Policy

The Good Builder

Uses the Policy as a wonderful aid in selling his houses.

The Architect

The Policy promotes better home building—therefore the architect's services.

The Financial Man

Uses the Policy to Safeguard his mortgages—and serve his clients.

The Manufacturer
The Policy emphasizes the importance of products of reputation and quality.





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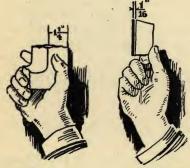
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"So-called" Porcelain

Jewetts are lined with SOLID porcelain, 1¼ inches thick. All other so-called "seamless," "one-piece" or "cleanable" porcelain linings are made of thin sheet metal coated with baked enamel. That's why Jewetts never dent, chip, peel, or rust out and why "they last a lifetime."



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In every fine kitchen where refinement and ultimate cost are the basis of choice, where every detail must conform to the exacting standards of owner, guest and architect, Jewetts predominate. QWhenever you want the best refrigerator that human ingenuity can devise, and 76 years of painstaking experience in the manufacture of high grade refrigerators create, whenever you want a product that will outlive even your greatest expectations, specify the Jewett. O They are especially adapted for use with electrical refrigeration because they steadily maintain the lower temperatures possible with such equipment.

> Send for free illustrated catalog. It will help you decide your kitchen lay-out—size, location, finish, etc.

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27 Chandler Street

REFRIGERATOR COMPANY

Established 1849 Buffalo, New York



## Arkansas Soft Pine





# Brings home and happiness within your reach, now!

—and where but in a home of your own can you and yours realize the best in wholesome living?

For beautiful woodwork, for an exterior that holds paint and looks trim always, and for a snug structure of tight joints and wind-proof walls, Arkansas Soft Pine has specific natural, ingrown advantages peculiar to itself.

These are interestingly described in our fascinating book of excellent home designs which is

yours for the asking. Produced in abundance, this wood enables you to build according to your taste and at *your* price. Write now, for your plan book and further helpful building hints.

Arkansas Soft Pine is grade marked, trade marked and sold by dealers East of the Rockies.

### Arkansas Soft Pine Bureau

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### Heating Happiness - How They Found It

OU see it was like this: Katherine MacDowell and husband Ned sold their House in the Woods, and started building another.

No sooner had they announced this among their friends and relatives, than they began receiving a fusillade of letters from them. Letters on everything from ironing boards, to the kind of heating to install.

Happily, we were able to induce them to let us look the letters over, and pick out the ones particularly devoted to heating. There were some half a dozen or more, which although fact-filled, are like reading a chapter of a favorite read the subjects covered, in the listings below.

author. Some are decidedly crisp. Two might be called amusing.

Every system of heating is considered, each letter giving reasons why some particular one is best, based on actual

To these letters, we added a goodly bundle of additional helpful hints, after which we had them all finely illustrated in colors, and made into a most attractive booklet called, Letters To and Fro.

Just to give you an idea of the real heating helps it contains,

### Send for Booklet

"Letters To and Fro" is wrongly called a booklet. It is really a full-fledged book. But never mind which it is, send for it. Don't miss having so many valuable angles on so many sides of the heating question; especially its comfort giving, coal saving side.

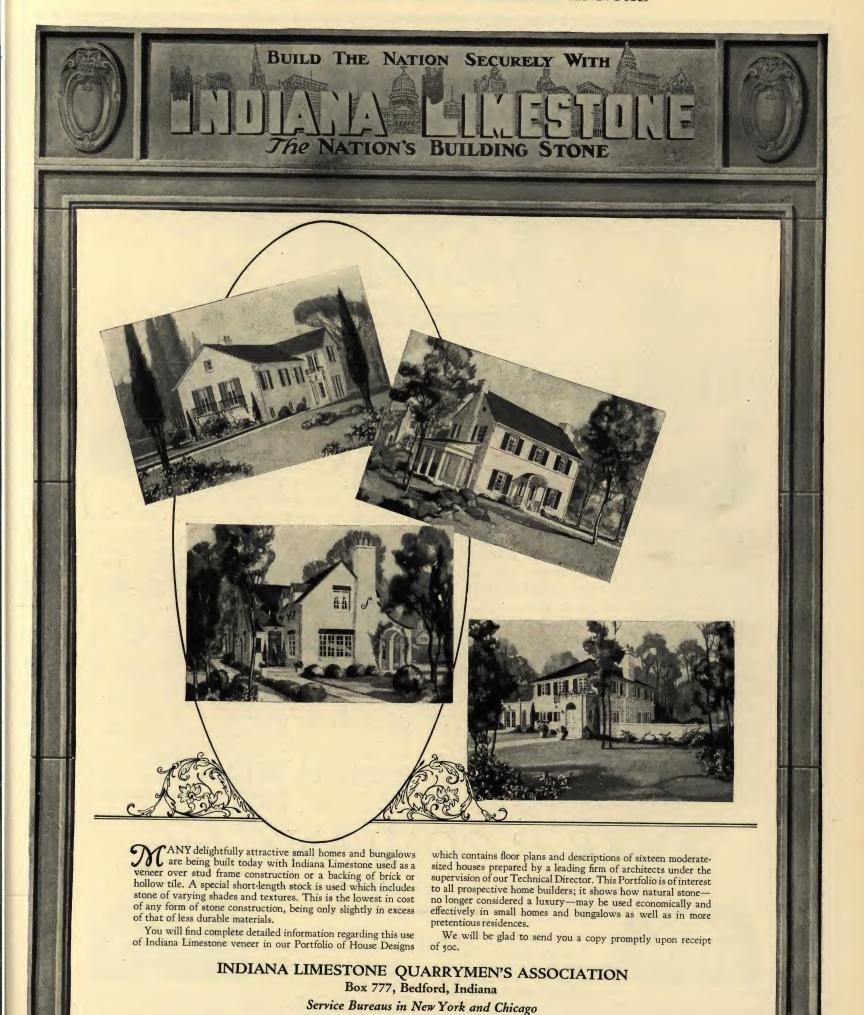
### Subjects Covered

- 1. Fireplaces, by one who has two.
- 2. William Crosby's reasons for recommending steam heat.
- 3. Hot Water Heat, as urged by Ned's Father.
- 4. The Vapor System as endorsed by Katherine's New England in-
- 5. The real truth about Warm Air Heating, as graphically told by an under-heated.
- 6. Radiators how to make them attractive.
- 7. Results after testing hot water heat for two years.
- 8. Some Homely Features that make a coal bill beautiful.
- 9. A lot of little coal saving points that are big.
- 10. The Magic Flue Brush or how another little thing will save a lot of money.
- 11. Two Coal Care Hints you'll wel-
- 12. Two pages of Your Questions and Our Answers.

IRVINGTON, NEW YORK

Representatives Principal Cities

Canadian Offices: Harbor Comm. Bldg., Toronto 124 Stanley Street, Montreal



## FISKE BRICK



### "FISKLOCK"

### The Two-in-One Brick

"FISKLOCK" is an interlocking channel brick which occupies the same space in the wall as one face brick and the common brick

which backs it up. "Fisklock" is 8" x 2½" x 8" and forms by itself an 8" wall, saving the labor cost of brick backing, saving ten per cent mortar, saving on freight, truckage and handling costs wherever the brick has to be handled. "Fisklock" is of rough texture and beautiful coloring similar to our famous "Tapestry." Brick. The hollow spaces in the bricks give a multitude of horizontal air cells. This effectively insulates against heat

and cold, making a cooler house in summer and a house easier to keep warm in winter. Hundreds of charming homes, economically built, testify to the excellence of "Fisklock" as a building material.

### "TAPESTRY"

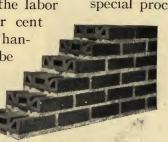
### The Most Beautiful Brick

"TAPESTRY" Brick is distinguished by its colors and texture. The soft, blending colors are natural,

obtained by careful selection, mixing and burning of special clays; the texture is the result of a special process of roughening the surface. Thus

the light on a "Tapestry" brick wall is caught and diffused so the rich, natural colors are still further deepened and blended. "Tapestry" Brick can be laid to give the weathered effect of age or the wall can be filled with life and color by using the appropriate shades of brick and mortar. The colors run from Indian red through coppers,

olive greens and purple-browns to deep blue. With another clay, we produce grays and browns and all colors include an infinite number of intermediate shades. The intense heat which produces these colors also burns "Tapestry" Brick to its remarkable hardness and imperviousness.



HOW "FISKLOCK" BRICK LOOKS
LAID IN THE WALL

## FISKE & COMPANY, Inc.



Boston

New York

Watsontown, Pa.

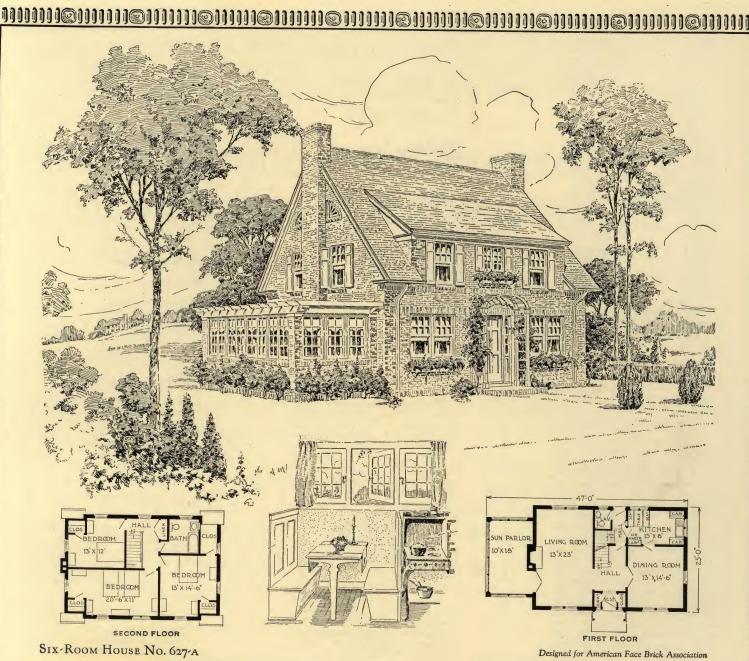
THE "Fisklock" home shown at the left was a prize winner in a recent F. B. A. competition. The economy of "Fisklock" combined with its

handsome appearance, its light weight and strength make it practical for homes, garages, walls; all kinds of construction in fact, where brick is appropriate.



very small compared to the total cost of a house; it is returned to the owner many times over both in satisfaction and in the increased value of the house as an investment. "Tapestry" Brick is made *only* by Fiske & Company.

"FISKLOCK," "TAPESTRY," "CALEDONIAN," "FISKE," AND OTHER HIGH-GRADE FACE BRICK



This house has just been built in Chicago by the Chicago Federation of Women's Organizations, in co-operation with "Better Homes in America," in its effort to stimulate better home building. Two years ago "Better Homes in America," of which Secretary Herbert Hoover is president, built the "Home Sweet Home" house in Washington, D. C.

### Beautiful Homes—Economical to Own

THE many color tones and textures in Face Brick—the artistic effects possible with various bonds and mortar joints—give a varied beauty unapproached by any other building material. The savings of the Face Brick house in repairs, depreciation and painting, in insurance rates and heating costs, in a few years wipe out its slightly higher initial cost and make it the most economical to own. The facts are more fully detailed in "The Story of Brick."

### Booklets You Ought to Have:

"The Story of Brick" is, as one reader says, "a liberal education in home-building." It gives just the information the prospective builder wants. Sent free.

"Face Brick Bungalow and Small House Plans" in four booklets, showing respectively 3 to 4-room, 5-room, 6-room, and 7 to 8-room houses, in all 104. Unusual and distinctive designs combined with convenient interiors. Any one booklet, 25 cents. The entire set, one dollar.

"The Home of Beauty" shows fifty two-story six-room houses

from 350 designs submitted by architects in a nation-wide competition. Sent for 50 cents.

"The Home Fires," a most attractive fireplace book, with many designs,

gives full directions for fireplace construction. Sent for 25 cents.

"A New House for the Old" will tell you all about restoring an old house with a beautiful, permanent overcoat of Face Brick. Sent free.

Address, American Face Brick Association, 1722 Peoples Life Building, Chicago, Illinois.



Things You Ought to Know about Casement Windows ...

Why Casement Windows?

SIDE from the charm and A inherent attractiveness that argues so strongly for casement windows, let us ask why have only half a window, with the slide-up-and-down kind, when you can have full opening windows with casements?

[1]

When you come to think about it, why shouldn't your windows open the full opening, quite as much as your doors?

Why should you be compelled to stoop down and literally hang out of a window when you want to fully see out, reach out, or get all the air there is?

Why should you hamper the air with a window that no matter how you juggle it, whether opened full at the top, or full at the bottom, or half both ways, gives only helf an opening? gives only half an opening?

As for screens—simply screen all the windows and then use Win-Dor Operators, which will easily open and close your windows from inside the room.

[2]

#### CHAPTER II

#### Why Outswung Casements?

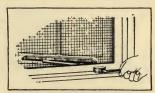
If someone tells you that casements are not practical—that they are pretty much of a nui-sance, the chances are a hundred to one that this person had the unfortunate experience that goes with the wrong kind of casements the kind that swing in.

In-swung casements are a nui-sance. They invariably leak because water runs down hill—a tendency so difficult to resist that most good weatherstrip firms will not guarantee tight in-swung windows. Even worse is the insurmountable objection that when opened into the room, casements are always in the way and play havoc with any but the most commonplace of curtain treatments.

[3]

How to operate outswung casements without awkward manipulation of screens, letting in insects and mussing up curtains, used to be a problem.

Now, since the development of Win-Dor Operators outswung casements are handled as easily with screens as without.



With the Win-Dor Operators you need only move a handle and your out-opening casement swings quickly and easily to any position you want, and safely locks against the wind.

[4]

You will understand then that the operators for your casements are not an unimportant detail to be settled at the last minute, but rather, a fundamental and highly important part of your plan and its most conspicuous feature—the windows.

#### CHAPTER III Casement Control

As already mentioned, Win-Dor Operators are made for control of the sash without disturbing inside screens. This inside control cannot be applied to sliding or folding sash or other spe-cial types of window.

Simplicity: Simplicity being a major virtue of the casement, it should be preserved in the operators. Much of the joy of casements is to be able to liter-

[5]

ally throw them open. Win-Dor Operators translate this pleasantly to a quick, easy swing of a handle. All Win-Dor Operators are quick-acting, never any tedious winding—always easy powerful leverage.



Installation: Win-Dor installation is amazingly simple. stallation is amazingly simple. They are applied after all trim (wood-work) is in place. No special preparation. Any carpenter or handy man can do it right the first time.

Applicable to Old Buildings: It follows that Win-Dor Operators may be applied to casements in most old buildings without change in wood-work—

[6]



a real discovery for people who didn't get Win-Dor control when they built. It's better, of course, to provide for Win-Dor in original contract.

Win-Dor Types: The illustration in section six (at extreme left) shows the New Standard Type of Win-Dor Operator (No. 7) which operates through an easily fitted notch in the bottom frame of the screen. It is made frame of the screen. It is made in parkerized or sherardized steel and in brass with dull or bronze finish. In the center drawing (above) is shown the Flush Type Win-Dor, which is installed sunk flush with sill and requires no notching of screen frame. This

[7]

is especially handy with metal-framed screens. Below is the New Standard Type of Win-Dor Stay-for use when screens are not needed or where it is desired to postpone installation of oper-



ators; for the sash channel of this stay will accommodate Win-Dor Operators whenever it is desired to substitute them for the stays.

Win-Dor Operators and stays are used on steel casements as well as on wood sash. For complete information address The Casement Hardware Co., 234
East Ohio Street, Chicago,
U. S. A.—Casement Hardware
Headquarters for Twenty Years.

[8]

## For beautiful stucco exteriors of uniform color and strength

Oriental Stucco comes ready for has Oriental Stucco or can get it strength.

Easy and economical to apply, Oriental Stucco goes on over metal lath, tile, brick and Gyp-Lap sheathing. Takes any degree of texture. Waterproof, non-stainingand permanent.

Your dealer in builders' supplies

use in white and nine mineral for you. Write for free booklet colors. Factory mixing assures with plaques showing the many thoroughly uniform coloring and pleasing effects obtainable with Oriental Stucco.

> Note: The characteristic textures illustrated elsewhere in this Building Annual can be reproduced in Oriental Stucco.

You'll find Textone the ideal material for reproducing beautiful and economical texture finishes on interior walls.

STATES GYPSUM COMPANY General Offices: 209 West Monroe Street, Chicago, Illinois

Makers of

Sheetrock

Gauging Plaster Ivory Keene's Cement

Textone

Moulding Plaster Sheetrock Finisher

Red Top Patching Plaster Bondcrete, for Concrete Gyp-Lap

ORIENTAL STUCCO

### You Need Either One or the Other

IF you have warm air heat, then you'll not be content or at all satisfied with just the ordinary plain faced registers.

Nor would you think of having the jig-saw designs which belong to the Mid-Victorian period.

As for having them shiny black or starey white, that's entirely out of the question.

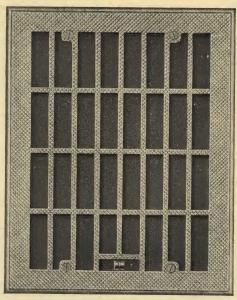
What you want is a register of restrained simple lines, having just enough design or texture to break up its blankness. In finish, a color tone effect that will harmonize with any decorative treatment you may have from time to time.

You can't be changing your registers every time you do your walls or draperies — still they must harmonize or your rooms have glaring, unharmonious spots.

This Cobble Face Register below, meets all such exacting requirements, even to being a wonderful neutral finish, called Tanbo Antique.

So happily does it harmonize with various room decorations and color schemes, that some of the leading hardware concerns are making door and window hardware to match.

Drop us a line and we'll give you more particulars and where to get these Tanbo Antique finished Cobble Registers.



Cobble finish prevents slipping. Has plenty of open space for free passage of heat. Cold air face made to match in design and finish.

IF you have radiator heat, then you have the problem of what to do to overcome your radiators' insistent obtrusiveness.

Bronze them; paint them; do what you will, and still they are the same, ever-present, ever-annoying, seemingly useless stacks of iron.

Many are the rooms, the decorative schemes of which are thrown completely out, by radiators. But happily for you, it's now possible at a reasonable cost, to enclose your radiators so they become an attractive, useful piece of furniture.

They can be one of our metal enclosures, finished to match your wood work or color scheme; or a combination of wood frame and grilles.

They will keep the dirt from being thrown up against your wall or draperies, soiling and often spoiling them.

They can be equipped with humidifier, turning a dry unhealthy heat into a healthy one. You can convert before-the-window radiators into cosy window seats.

You can make their tops useful, quite like they were an attractive side table or console.

You have so much more than a mere radiator enclosed.

You have a fine piece of furniture — that has utility without looking utilitarian.

Send us the size and width of your radiators, and we'll gladly send you full particulars.



This enclosure has a Woven Steel Cane Grille. A Steel Grille one-half inch square design or Ferrocraft Period Grille may be used instead.

### TUTTLE & BAILEY MFG CO.

36 Portland Street BOSTON

441 Lexington Avenue NEW YORK

1123-29 West 37th Street CHICAGO Bridgeburg CANADA

ON
704 E. 18th Street
KANSAS CITY



## Simplicity and Good Taste

The Mahogany handrail and treads effectively accentuate the graceful sweep of this staircase, while the mahogany door and furniture harmonize and yet contrast with their surroundings.

Genuine Mahogany woodwork costs but a trifle more than other cabinet woods.

It responds perfectly to any finish, especially the simpler methods toward which the present trend is strong.

Properly finished, it harmonizes with any decorative scheme.

If your architect or contractor cannot substantiate these facts, write us.

We welcome opportunities for service.

Ask For and Insist On Genuine Mahogany Woodwork

MAHOGANY ASSOCIATION, Inc. 1133 Broadway, New York, N. Y.



A Postal request will bring our Books "HISTORIC MAHOGANY" "STATELY MAHOGANY" interesting—instructive complimentary

A NATIONAL ORGANIZATION of MAHOGANY PRODUCERS

### A JOY of THE MODERN HOME

PICTURE to yourself the pleasure—the comfort—the convenience—of a trouble-free automatic water heater, minus the drawbacks of the old types. With the EverHot you have all the hot water you want simply by turning the faucet. For this kind of hot water service you gladly pay a big premium in a first-class hotel—but in your home with an EverHot Heat—the cost is modest—probably less than the old way. Investigate the EverHot heater. You'll be convinced.

### Note the Construction

IN the EverHot the entire outside surface of the storage boiler is used as heating surface. Other manufacturers cover up this splendid expanse of heating surface and then add another at additional expense and the added surface is usually not nearly so large or so effective as is the heating surface in the EverHot Heater. The insulation used in the EverHot Heater is Rock Wool —one of the best insulators known. Not only is it a very high-grade insulation, but it has a high refractory value.

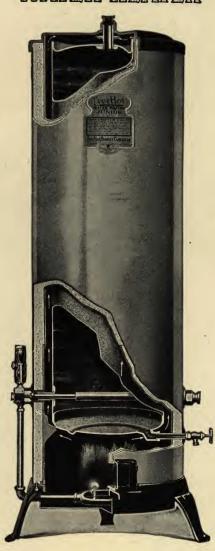
The Thermostat has been very successfully used for over 24 years. It is simple, positive-acting and all metal.

The Burner is gauzeless, non-flashback, non-carbonizing, semi-Bunsen burner. We have entirely eliminated the troubles resulting from the use of the old style Bunsen burner.

Because of the construction of the EverHot Heater, condensation has been almost entirely eliminated. Condensation has been the cause of most of the trouble experienced with old types. Freedom from condensation is a reason for the marked freedom from trouble in the EverHot.

The finish is satin silver automobile lacquer, more durable than enamel and radiates less heat.







### A Record to be Proud of

In five years we have never charged a cent for service or repairs—a record that has never been equaled in the automatic water heater field. That fact alone proves the merit of the heater.

When EverHot introduced the self-contained, automatic storage type—embodying new principles—it was called "radical." Lately many old-line companies have followed. Gas economy, long life, low price, fine appearance and better results are the reasons.

### Capacities

Baby Grand: The Baby Grand Heater will serve the ordinary small home and small family where hot water requirements are not extraordinary. It will deliver within two hours time 60 to 70 gallons of hot water.

Junior: The Junior will serve the average medium size household in a home equipped with kitchen, laundry and a bath with shower. It delivers within two hours time 80 to 90 gallons of hot water.

Senior: The Senior Heater will supply the large home equipped with kitchen, laundry and two or three baths with shower. It also will supply an average 2-family apartment. It will deliver within two hours time 150 to 170 gallons of hot water.

Prices: BABY GRAND \$66.00 , JUNIOR \$88.00 , SENIOR \$139.00

## EverHot Heater Company

5201 Wesson Avenue, Detroit, Michigan



### Advantages of Armstrong's Corkboard

### 1. An Excellent Non-Conductor of Heat

Armstrong's Corkboard contains millions of microscopic cells, each sealed by nature and containing entrapped air—the best insulation known except a vacuum.

### 2. Non-Absorbent and Sanitary

Armstrong's Corkboard will not absorb moisture and needs no furring strips. It does not mold, rot or provide harboring places for rats, mice or vermin. It lasts as long as the house.

### 3. Structurally Strong and Easy to Install

Armstrong's Corkboard is strong in structure and is easily nailed in place in frame buildings or readily set in Portland cement mortar against brick or tile.

#### 4. An Excellent Base for Plaster

Armstrong's Corkboard takes and holds plaster permanently. No lath is required since the plaster keys firmly into the surface of the corkboard.

### 5. Slow-Burning and a Fire-Retardant

Armstrong's Corkboard is slow-burning and a positive fire-retardant. It will not burn unless flame is applied from an external source, and does not smolder or carry fire.

#### 6. Reasonable in Cost

Armstrong's Corkboard is not expensive and is economical to install. Furthermore, its use makes possible a considerable reduction in the size of the heating plant and effects savings of 25% to 30% in

WARM in winter—cool in summer. From the standpoint of comfort, these are the two outstanding features of the cork-lined house. In winter, it is uniformly warm. It has no "cold side," no rooms that are "hard to heat." In summer, it is many degrees cooler, upstairs

The reason is simple enough. Armstrong's Corkboard is a non-conductor of heat, one and a half inches being equal in heat-retarding value to more than 20 inches of brick or concrete. Built into walls and roof (or the top-floor ceilings) it renders the construction practically impervious to heat and insures the protection from outside temperatures that makes a house a comfortable home.

In addition to comfort, there is the matter of economy. The house that is insulated with Armstrong's Corkboard can be easily heated by a smaller plant and with much less fuel. Reduced radiation and lower fuel bills soon repay the cost of the insulation.

Armstrong's Corkboard is not expensive and is very easily installed in any kind of construction—nailed to study, rafters or joists, or laid up in cement against masonry, without furring strips. It is an excellent base for plaster; no lath is required. Armstrong's Corkboard is non-absorbent and does not rot, mold, shrink, or swell. It is vermin-proof and a fire-retardant.

A sample and complete information may be obtained by writing to the Armstrong Cork & Insulation Company (Division of Armstrong Cork Company), 191 Twenty-fourth Street, Pittsburgh, Pa. Canadian office, McGill Building, Montreal, Quebec.

Branches in the Principal Cities

# Armstrong's Corkboard Insulation

for Residential, Commercial and Industrial Buildings

### BEAUTIFUL FLOORS-BEAUTIFUL HOMES



## When You Decide on Your Flooring—Remember

Here's the Reason That rich coloring, flawless surfaces and an ensemble effect of singular beauty, such as made the early mansions of Virginia famous for their exquisite interiors, are now within your reach.



Is the exact duplicate of that original material of Colonial days which Romance and Story picture so often as reflecting the cheery, open fire, or catching the silver sheen of moonlight. Indeed, it is more than flooring—it is the keynote of beauty inside the house.

Nor are you limited as to finishing. Wax it if you like in its beautiful natural color, or stain to suit your decorative motif, should you select a darker note. Match the predominating tones of your rugs, or gain pleasing contrasts with walls and

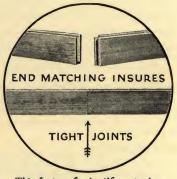


Slow growth for 150 years produces extreme density and great strength

"Rift" is another term for quarter sawn or comb-grained. In Dixie Flooring this method takes every advantage of the handsome grain, dense growth and great strength peculiar to the special timber from which it is cut. Added to these individual merits is the feature of End-Matching—the crowning achievement in DIXIE brand—which insures mirror-smooth surfaces, absence of squeaks, and, on the economical side, lowest cost in laying.

Dixie Rift Flooring bears the above trade mark on the back of each piece. Your favorite lumber dealer can supply you and we'll be happy to give you complete finishing instructions and further interesting facts. Write now!

JACKSON LUMBER COMPANY
LOCKHART, ALABAMA



This factor of scientific superiority provides mirror smoothness and prevents squeaks



### STANDARD EQUIPMENT

THED STATES RADIATOR

This letter from the Majestic Homes Corporation is well worth reading. It explains just why an entire colony of 150 homes adopted Capitol Boilers and United States Radiators as standard equipment.

We feel that no finer tribute has ever been paid to a manufacturer of heating plants. And, best of all we know that every individual Capitol installation will continue to deserve the confidence that has been reposed in it.

> We shall be glad to send you an illustrated booklet which fully explains the modern idea in house heating.

### UNITED STATES RADIATOR (ORPORATION

General Offices, Detroit. Michigan

## United States Radiator Corporation, 4004 Duncan Avenue, St. Louis, Missouri. The Majestic Homes Corporation, being per-ps the largest builder of fine homes in the middle West, feels at it cannot afford to take any chances with any other but the st of equipment in every line, and in using Capitol Boilers and ited States Radiators, we feel that we are using equipment which in keeping with the high standard of building which we maintain. Wishing you continued success, we remain, Yours very truly, MAJESTIC HOMES CORPOR Albert a. aufuchto Vice-President. AAA:RR

# Capitol Boilers

BRANCH AND SALES OFFICES

Boston • Springfield, Mass. • Portland, Me. • Providence, R.I. • New Haven • Troy, N.Y. • \*New York • Brooklyn Harrison, N.J. • Philadelphia • Baltimore • \*Buffalo • \*Pittsburgh • Cleveland • Columbus • Cincinnati • Detroit Chicago (No. Side) • Chicago (So. Side) • Milwaukee • Indianapolis • Louisville • St. Paul • St. Louis • Kansas City • Des Moines • Omaha • Denver • Seattle • Portland, Ore. \*Warehouse stocks carried at all points except those indicated by star.



TF you look at two homes, one having ordinary windows and I the other equipped with Lupton Casements of Copper Steel, you will find your interest is irresistibly drawn to the home with casements.

There is something about the trim, well-proportioned look of outward swinging steel casements that makes the exterior of the house most inviting. Their charm and home-like comfort are even more apparent from the inside.

When you consider how much any house is improved by Lupton Casements—how it is made more beautiful and convenient, it is not surprising that these windows are so widely used—especially as they cost so little more than wood.

Frame, brick, stucco, English cottage or Spanish style, court apartment or duplex, all are made more attractive and valuable by the application of these charming windows. Let us send you our new book C-122 which illustrates a number of installations.

Call on nearest branch office or your local dealer

DAVID LUPTON'S 18 71 SONS COMPANY
Philadelphia, Pennsylvania 2251 E. Allegheny Avenue

To make your home complete, you will want Lupton Steel Basement Windows. They admit 88% more light than the old-fashioned kind.

Lupton Basement Windows are

as easy to set as wood windows

and come complete with hard-ware and one coat of paint. Being made of solid copper steel bars, they never stick nor rot. They discourage intruders and resist fire. Use Lupton Steel Windows

from basement to attic.

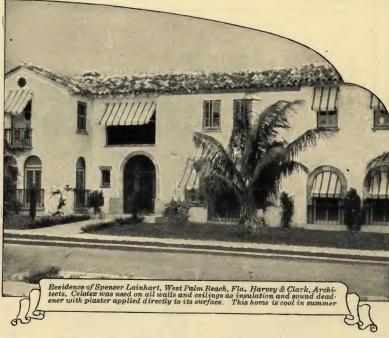


New York Pittsburgh

PTO

EVERYWHERE STEEL





## Warm in January yet Cool in August

## Senjoy all-year comfort in your home with Celotex Insulating Lumber

HE day of the old-style, heat-leaking house is past. Home builders no longer put up with houses that are chilly and draughty in winter (in spite of big fuel bills) and hot and stuffy during the summer.

They don't have to! Modern homes are insulated with Celotex Insulating Lumber, at no extra building cost.

#### Celotex stops heat waste

Tests show that one-third of the heat generated to warm the old style, uninsulated house is wasted. It passes right through the walls and roof-just as radio waves do.

But Celotex stops heat. It means warm, cheerful coziness indoors when January's icy wind roars outside. And it means cooler, more restful rooms during the blistering days and sweltering nights of midsummer.

#### Other Celotex benefits

Celotex homes are more healthful—free from draughts and cold floors. Because Celotex is an effective sound-deadener, a restful, nerve-relaxing quiet will pervade this Celotex home of yours.

Celotex construction makes your home modern, as well as stronger. It insures the future resale value of that home.

In addition, Celotex saves 1/3 of your fuel bill and permits the use of a smaller, less expensive heating plant.

#### Why Celotex comfort costs no more

You can have this Celotex comfort at no more than the cost of ordinary construction. Because wherever used—as sheathing, or inside the house, where plaster is applied directly to its surface—Celotex takes the place of wood lumber or some other material and any form of insulation. Celotex is the only insulating material that is not an extra.

#### Get all the facts

Ask about Celotex before you build or buy a

If you are going to build, use Celotex. It is available everywhere. Your architect, contractor, or lumber dealer will explain its uses fully -ask him to tell you about Celotex.

If you are going to buy a completed home, insist upon one built with Celotex.

#### New building book FREE

Send coupon below for our free building book, fully illustrated in color. It contains information every home owner should have.

### THE CELOTEX COMPANY, CHICAGO, ILLINOIS MILLS: NEW ORLEANS, LA.

Branch Sales Offices: (See telephone books for addresses) Boston Cleveland Dallas Denver Detroit Kansas City

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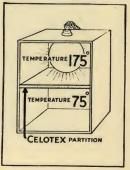
Canadian Representatives: Alexander Murray & Company, Limited Montreal Toronto Halifax Winnipeg Vancouver

# INSULATING

A. Clapboards, brick or stucco B. Celotex Insulating Lumber C. Studding or framework D. Celotex Insulating Lumber E. Plaster
Cross-section showing applica- tion of Celotex Insulating Lum-

E. Flaster
Cross-section showing applica-
tion of Celotex Insulating Lum
ber: (B) in outside walls as sheath
ing, where it replaces wood
lumber and building paper, and
(D) on inside walls, where plaster
is applied directly to its surface.

The Celotex Co., Dept. 941 645 N. Michigan Ave., Chicago, Ill. FREE Please send your free illustrated building book. Building Book



Note this actual test. A Celotex box is divided in half by a layer of Celotex. The upper half is heated by an electric lamp. The lower half is 100° cooler. In the roof and walls of a house, Celotex keeps heat in during the winter, out in summer.



### Now Instant Waste Disposal for Your "House o' Dreams"

YHETHER we like to admit it or not, the fact is that we are entering a domestic servantless age. Inefficiency and ridiculously high wages are making it impossible for housewives, who would formerly have had servants, now to have them. This condition will get worse, not better.

Build with this fact in mind. Banish the garbage nuisance. Stop those unending, unpleasant trips to garbage can and rubbish pile. Gain perfect tidiness of basement and yard. Do it with the Kernerator, which accomplishes instant garbage and waste disposal without leaving the kitchen.

### Costs Nothing to Operate

The Kernerator consists of a brick combustion chamber in the basement, connecting with hopper doors on floors above. Into these is dropped all types of waste — garbage, sweepings, tin cans, broken crockery, old magazines, wilted flowers, etc. An occasional lighting destroys the accumulation and metallic ob-

Consult your architect or contractor. Both know and recommend the Kernerator. Or write for complete descriptive literature, giving the number of your favorite plan in this book.

### KERNER INCINERATOR CO.

780 East Water Street Milwaukee, Wis.



### Thousands of Homebuilders write to this "Library"

Perhaps it contains information valuable to you

ORE and more, people are asking, "What Hardwood?" More and more, people are assume,
They are coming to realize the versatality—the alluring possibility—in floors.

They call Maple "the floor of captive sunlight." They seek ballroom beauty for the floors of their homes.

Or they want color harmony. They want their flooring to harmonize with the color of their walls, their woodwork, or draperies. They want to stain their floors—and be sure that their flooring, when stained, will be a beautiful and uniform color, with no fibrous ridges showing through.

Others are interested in "hardwood carpets." They wish to know how they can lay new hardwood floors right over old floors—without disturbing doors or baseboards—and at no more than the cloth carpet cost.

Do you know the richness, the varied charm, provided by floors of Maple, Beech or Birch? All three are hardwoods. All are beautiful in themselves-waxed or varnished. Tough of fibre and tight of grain, Beech and Birch wear almost like Maple and Maple outwears stone.

By all means, know these hardwoods. When they bear the MFMA trade-mark, it means that they are made according to exacting standards—from the slow-growth, climate-hardened woods which have stood the rigors of the northern winters.

Before you build or remodel—get the information which this "library card" will bring to you. Send for the literature you wish to see — it will be mailed without cost and without obligation.

MAPLE FLOORING MANUFACTURERS ASSOCIATION 1038 STOCK EXCHANGE BUILDING CHICAGO, ILL.

-	G	ua	ra	nt	eed	Fl	oorin	gs_
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The letters MFMA on Maple, Beech or Birch flooring signify that the flooring is standardized and guaranteed by the Maple Flooring Manufacturers Association, whose members must attain and maintain the highest standards of manufacture and ad-

### MFMA Library Maple Flooring Manufacturers Association Maple Flooring Manufacturers Ass. 1038 Stock Exchange Bldg., Chicago, Ill. Please mail to Namethe pamphlets and booklets named below: Address. Color Harmony in Floors Color Harmony in Floors Three Native Hardwoods of Sterling Worth Why and Where to Use 1½-Inch Face Flooring How to Lay and Floors Beech and Birch Floors The Floor Which the Years Will Make Precious The Floors for Your Home New Floors for Old What You Can Do With Wide Face Flooring

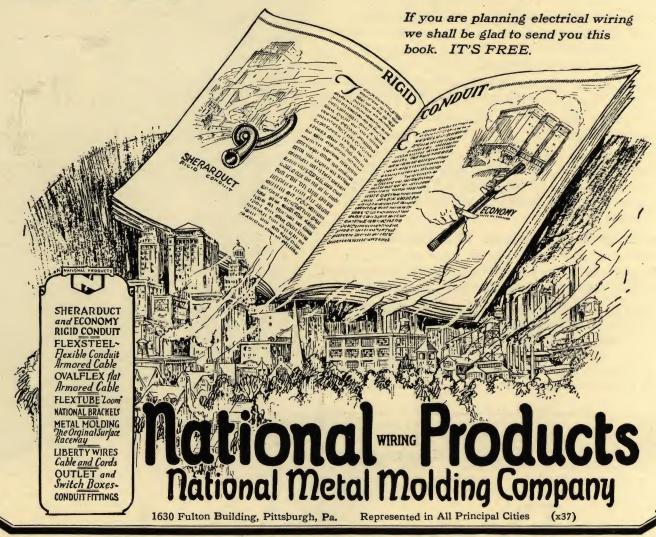


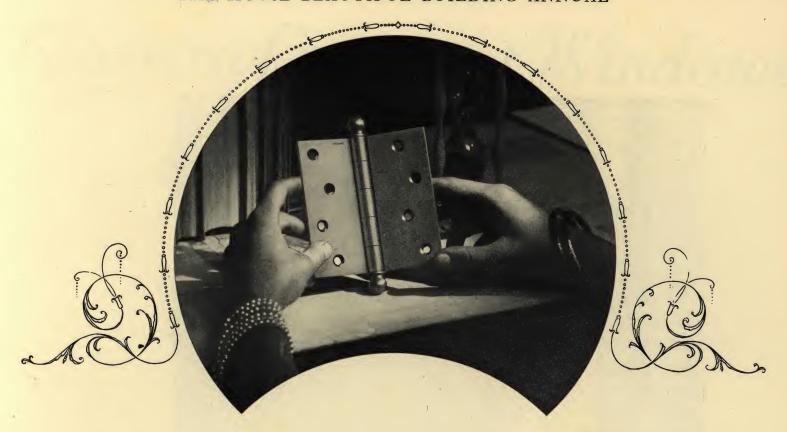
## Floor with Maple Beech or Birch

# For Better Lighting

BETTER lighting brings comfort, beauty and color to the home, efficiency to the office, attractiveness to the shop window and convenience and usefulness everywhere. Back of better lighting is better wiring because one can not exist without the other.

The wiring system is a vital part of any building, a subject the owner should know something about. Making electrical wiring safe, permanent and trouble-free is the foundation on which the National Metal Molding Company has built a great institution and a world-wide business. The subject of better wiring is not intricate or technical. Details can be told in a simple and interesting way and are told in a book "Better Wiring for Better Lighting."





Care in the selection of finely appropriate hinges indicates that you are cognizant of the decorative value of a well-chosen hingeand more: It is evidence of your appreciation of the importance of all details. To select McKinney Hinges is to provide for an additional source of pride and satisfaction in your home. Make your choice early. Your architect and builder will applaud your forethought and lend assistance gladly.

### A Gift for Those About to Build

To know where your furniture will fit before your home is completed is a constant benefit. To know before construction begins is even more valuable.

So McKinney designed Forethought Plans for this purpose.

To get the key to the plans recall your early instructions in arithmetic. When the problem consisted of adding together "gallons," "quarts" and "pints," the rule was to change each item to "pints"—and avoid error.

That is exactly what McKinney has done with your furniture.

Your floor plans are drawn to a scale one-quarter of an inch to the foot. The



McKinney Forethought Plansare views of your furniture drawn to exactly the same scale. Here, then, you can arrange and rearrange your furniture with accuracy even before your cellar has been excavated.

McKinney is receiving many letters of grati-tude from home-builders. They are finding the McKinney Forethought Plans of wonderful value. They seem to answer completely a hitherto-vexing problem. The joy of seeing every piece of furniture in place so far ahead of time adds another note of pleasure to the building of a home.

The coupon below will bring you a set of these Forethought Plans. McKinney will enjoy the privilege of sending them. There is no cost to you.

McKinney Manufacturing Co., Pittsburgh, Pa.

## MCKINNE

You can obtain McKinney Hinge quality in sundry hardware articles, including complete hardware for garage doors



McKinney Manufacturing Co., Pittsburgh, Pa.

Please send me set of Forethought Plans.

(If you have a hardware retailer from whom you intend to buy, we would like to know his name also.)



## A Laminex door would have saved all this!

TIME was when doors were "just doors." If they warped and jammed, rattled, cracked and came apart owners simply shrugged their shoulders, sighed and stood repair bills.

We asked 3000 architects and builders to state the cause of most door troubles. "Wet bathrooms, steamy kitchens, newly plastered walls," most of them said. Laminex doors are immune to all such conditions. They do not warp, swell nor shrink.

Today there's a marked difference twixt common doors and Laminex — the door with a definite *guarantee*. And the cost is no more — due to immense facilities and huge scale production. We are the world's largest manufacturer of doors. Every step from virgin forest to finished, tested, Laminex door, under one management.

Beautiful Laminex doors of Douglas fir are carried by lumber and building material dealers, in a variety of approved styles. As the name implies they are laminated — built up of layers of wood crossed at right angles. Resulting strength is many times that of solid wood. Intense pressure and Laminex waterproof cement unites the layers. A Laminex door will last for ages.

Write for literature and "test-it-yourself" sample of Laminex wood.

### THE WHEELER, OSGOOD COMPANY, Tacoma, Washington

Sales Offices: New York, Chicago, Memphis, Los Angeles, San Francisco, Spokane and Woco Door Co., London, England

### Famous Laminex Water Test

Original test made by Prof. B. L. Grondal in 1923. Laminex door soaked for 24 hours. At Tacoma "Own-Your-Home" Exposition, 1924, Laminex in water 132 hours.

C. R. McCauley Corporation, Brooklyn, N. Y., exposed Laminex door on warehouse roof all winter. In June 1924, Lionel Ray, door dealer of Memphis, tested Laminex in his own way—exposed a stock Laminex door to blazing sun by day and summer rains at night. When there was no rain he turned on the water. For 20 days and nights the test went on.

Scores of other water, heat and strength tests prove Laminex the 100% door.

## LAMINEX DOORS

## Fenestra Casement Windows



# Something Better that costs no more

Beautiful Fenestra Casement Windows—you'll want them in your new home because they're better than ordinary wood windows and they cost no more.

Here's why they're better:—they admit more light—make every room homier—cozier. They add to the architectural effect. They provide better ventilation. Being of steel, they never warp, stick, swell or rattle. They are weather-proof and fire-resisting. They are washed

easily without sitting on the sill. Screens are inside where they won't rust and where they help keep the draperies clean.

They are low in cost because they are made in standard sizes and come complete with sash already hung and hardware furnished—ready for installation.

Why not modernize your new home with these beautiful steel casements? Your local lumber dealer can deliver them with your other building materials.



And the Brighter Fenestra Basement Costs No More

When you decide to have Fenestra Casements in your home you'll surely want Fenestra Basement Windows in the foundation walls. You'll want the extra light, extra ventilation and extra "all around" usefulness these sturdy, fire-resistant windows give—especially when such worth-while advantages can be obtained without extra cost.



And You Can Modernize the Garage Without Extra Cost

Extra Cost

Think of it—every window in your home and garage can now be built of steel at practically no greater cost. Fenestra Garage Windows, beside admitting an abundance of light around the car, carry away the fumes and gases. They are easily installed and, like other Fenestra Steel Windows, can be obtained from your local lumber or building supply dealer.

DETROIT STEEL PRODUCTS COMPANY, A-2258 E. Grand Boulevard, Detroit, Mich.

Factories in Detroit, Mich., Oakland, Calif., and Toronto, Ont., Canada

For Canada: Canadian Metal Window & Steel Products, Ltd.,

160 River Street, Toronto, Ont.

Tenestra

homes and apartments schools and institutions commercial buildings all industrial structures







## Kelvination-

### The mark of a truly modern Apartment or Home

Greatest of all conveniences found in modern homes and apartment buildings is the refrigerator with equipment producing its own cold—requiring no ice, demanding no attention. Instead of ice, with its uncertain and annoying delivery, Kelvinator, the pioneer system of domestic electric refrigeration, is being used.

Kelvination is automatic refrigeration. Day and night—winter and summer—it keeps the refrigerator constantly colder than does ice. It never needs replenishing; you don't even have to think about it.

But Kelvination is more. It is refrigeration with dry, frosty cold that does more than

merely keep foods; it actually *improves* them. It adds crispness to salads, freshness to vegetables, mellowness and tenderness to meats. It freezes pure cubes of ice for the table.

Whether you live in an apartment, a modest home or a mansion, there is a Kelvinator model to meet your requirements. You can put one in the refrigerator you are now using, or you can install the Kelvin-et, which is Kelvinator and refrigerator all in one.

In either case perfect refrigeration, independent of all outside conditions, is automatically assured. The dealer in your city will gladly explain Kelvinator, or we will send you literature on request.

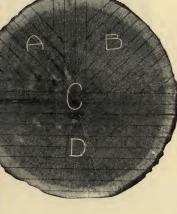
KELVINATOR CORPORATION, 2053 WEST FORT STREET, DETROIT MICHIGAN Kelvinator of Canada, Ltd., 529 West Pitt Street, Windsor (172)

## Kelvinator

The Oldest Domestic Electric Refrigeration



Quarter sawing brings to the surface the characteristic "flakes" or "flashes" in the cell structure of oak. Sections A, B and C of the fine oak log shown below will be quartersawn to adorn your home with beautiful Bruce quartered oak flooring. Section D will be "plain" sawn.



### Look to the Floor

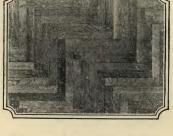
THAT the rooms of your home may suggest dignity, beauty, and comfort, and reflect in every intimate detail the personality of the owner, look to the floor—the foundation which determines the character of the room. It is the largest single element of decoration next to wall space, and its successful treatment enhances the appearance of your furniture, pictures, and rugs.

Nature provides in oak a flooring material of distinctive beauty, quite aside from its permanence and wearing qualities. Its mellow natural coloring may be varied to suit individual taste by using color finishes, or by medium to deep weathered tones. A finely finished Bruce oak floor is a triumph in the adaptation

of one of Nature's exquisite gifts to man. Bruce manufacturing skill brings oak flooring within reach of any home, either quarter or plain sawn, and in a great variety of grades, widths, and thicknesses. There is a grade to come within the estimate set for each room; and for principal rooms, a final touch of distinction may be added by the use of Bruce design flooring at a cost only slightly greater than strip flooring.

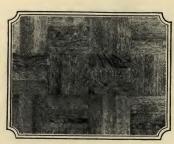
### Write for this book

"Just Inside Your Threshold" suggests many ways to individualize your floors at reasonable cost. This very helpful book will be mailed free on request.



Chateau and mansion of olden days bear testimony to the supreme elegance of design pattern oak floors, now supplied by Bruce within reach of the most modest purse.

Herringbone (above) and square pattern (below) are two of many handsome varieties.







### "Neither Snow Nor Rain Nor Heat-"

Year after year a roof and the devices that drain it must wage war with the elements. If the battle is mechanical, the years will be many. But if it is chemical, the years will be few. Conductor pipes, gutters and standing seam roofing of Horse Head Zinc are permanent for they cannot rust.

A booklet has been published under the significant title "Once in a Lifetime." It is yours for the asking. It shows how roofing and accessories of Horse Head Zinc can be installed on your house at only a slightly higher cost than that of temporary material, and at

a fraction of the cost of any other permanent metal.

If you are planning to build or are facing the usual spouting repairs, you will need this Booklet. Write to The New Jersey Zinc Company, Dept. H. B. A., 160 Front Street, New York City.

Horse Head Zinc roofing and accessories in all standard shapes and sizes are available through your local sheet metal contractors.

The New Jersey Zinc Company

Cstablished 1848
Products Distributed by
The New Jersey Zinc Sales Company
160 Front Street, New York City
CHICAGO PITTSBURGH CLEVELAND SAN FRANCISCO

New Jerse



Pergola Entrance to Estate of J. Wade Tucker, Esq., Kissimmee, Florida, entirely of "Tidewater" Cypress, as is the magnificent home in background.

## For Beautiful Homes of Enduring Worth

nothing quite equals "the Wood Eternal". It offers supreme resistance to decay producing agencies by virtue of a natural preservative grown into the wood. A century, or more, of service under the most trying conditions is a matter of historic record for this ideal building material.

For Durable Construction, therefore, use "Tidewater" Cypress for all parts that must withstand the ravages of time and weather, or contact with the soil—foundation timbers, sills, siding, porches (supports, floors, steps, columns, and rails), sash, shutters, cornices and all exterior trim. The same enduring qualities recommend it for pergolas, garages, fences, trellises and other exterior woodwork.

"Tidewater" Cypress also takes paints beautifully, retaining its fine appearance without discoloration for many years.

Attractive Interiors are easily achieved by employment of "the Wood Eternal" for trim and doors. It has a beautiful grain that offers rare opportunity for artistic effects with light stain or natural finishes—and provides a suitable base for paints or enamels. Its ease of working and ability to "stay put" when properly dried, are other qualities that endorse it for this purpose.

INDOOR FLOORS OF TUPELO combine moderate cost with long service. The close involved grain of this wood provides a floor that becomes smoother and solider under the wear and tear of daily use. Tupelo mouldings and trim permit of a pleasing variety of finishes for different rooms; scrupulously manufactured in modern designs, and very economical.

Prospective Home-builders are invited to write for valuable informative literature on these woods. Also ask us any questions. We'll only recommend "Tidewater" Cypress or Tupelo for uses where they're best for you.

### SOUTHERN CYPRESS MANUFACTURERS ASSOCIATION

1340 Poydras Building, New Orleans, Louisiana or 1340 Graham Building, Jacksonville, Florida



Beautiful suburban home of A. L. Schwenke, Esq., Bay Shore, Long Island. Mr. Dwight James Baum, New York, Architect. Enduringly built with "Tidewater" Cypress—siding, shingles, porches, cornices, rails, window shutters and frames, and all exterior trim.

Look for this Arrow on every board or bundle. It identifies genuine "Tidewater" Cypress



BUY BY THE CYPRESS ARROW AND SAVE BY THE YEAR



F course, the first and almost invariably the most important feature of any home is its architectural treatment. I "How will it look when it's finished," means almost everything to the American home builder. I Naturally, then, with such a universal desire for beauty, isn't it fitting and proper to suggest that home owners take every precaution to preserve that which is so dear to them. If the materials used in the building of a home are cheap and untried, then the structure, which most of us have only one opportunity in a lifetime to erect, will be short lived. Build once for all time. Use permanent firesafe materials. And when it comes to the interior finish of the walls, insist upon the use of Banner Hydrated Finishing Lime. Banner is made in the world's largest single plant devoted exclusively to the production of one brand and from limestone quarried in the heart of the country's finest deposits. Vou'll be sure of snowy-white, velvety-smooth, hard walls that won't crack or warp when Banner is used. Your architect may be one of the majority who are specifying Banner Finish every day but to be certain just tell him you want Banner Finished walls. And if you want to know more about this popular, time tested material, write us.



# Banner

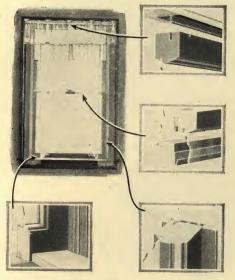
Easy to Spread Hard to Beat

NATIONAL MORTAR & SUPPLY CO., Pittsburgh, Pa-

hc Best Building Supply Dealers Everywhere Stock Banner

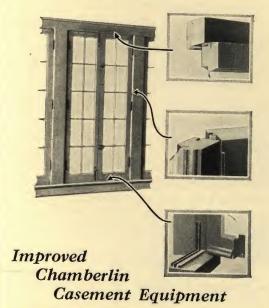
### Chamberlin Lifetime Weatherstrip Guarantee Applies to Every Type of Window

Specialized Installation Insures Saving of Fuel and Protection from Dust, Soot, Draughts and Rain



### Chamberlin Weather-Proofs the Sliding Window

Note how Chamberlin equipment protects the vital spots of the double-hung window. This design, perfected and improved in 33 years of practical experience, effectually keeps out draughts, dust, soot and dirt. Drenching rain or drifting snow cannot penetrate beyond the sealed contacts. Rattling of windows is eliminated. Windows raise and lower smoothly and easily without sticking.



The casement window, used more and more in home construction, is either a single or double type and opens either in or out. In-leakage of rain or dust takes place to an especial degree through the cracks of this type of window. But Chamberlin equipment of special design, almost hermetically seals casements against adverse weather conditions. Protection, equal to that on ordinary windows, is thus obtained.

In planning your new home, you may safely choose either the standard sliding window or the popular casement type, knowing that Chamberlin specializes in weather stripping every kind of window and door opening.

Chamberlin maintains a nationwide organization with sales and service in more than 80 cities. Chamberlin's own experts plan, fit and install all Chamberlin Metal Weather Strips. It is an absolutely necessary service to the satisfaction of weather strip users.

Because Chamberlin knows installations are correctly made by Chamberlin experts, it guarantees all installations for the life of the building. Any need for attention on any Chamberlin installation, no matter how many years hence, will be promptly and cheerfully given.

### Chamberlin Saves Cost in Fuel Alone

Chamberlin Metal Weather Strips annually save from 25% to 50% on your heating bills. They insure even heat. No cold spots. No dangerous draughts to menace health of children. And Chamberlin Strips keep homes clean. Protect furnishings from dust, soot and rain. Redecorating is not a yearly necessity. Chamberlin Strips save half the tedious, endless toil of housecleaning, dusting and scrubbing.

### Air Leakage Through a 32" x 32" x 32" x 13/8" Window With and Without Chamberlin

The information below is obtainable in laboratory tests but because laboratory conditions are more exacting, Chamberlin efficiency is from 5% to 10% higher under

actual working conditions as proven by numerous tests of Chamberlin equipment on buildings everywhere.

Wind Velocity Miles per Hour	Leakage thru Window Not Weather Stripped	Leakage thru Window with Chamberlin Installed	Per Cent of Leakage Prevented by Chamberlin Strips
14.38	2700 cubic feet per hour	330 cubic feet per hour	90 per cent
20.35	3900 " " " "	570 " " " "	871 " "
24.90	4680 " " " "	744 " " " "	865 " "
28.77	5400 " " " "	888 " " " "	854 "
32.17	6000 " " " "	1038 " " " "	85% " "
35.24	6540 " " " "	1176 " " " "	845 " "

high contains 1600 cubic feet of air. One

leaky window can change all the expensively heated air in such a room at least 40 times in every 24 hours. The harder the wind blows the more cold

A room 20 feet long, 10 feet wide, 8 feet and dust laden air will leak into your home. Under normal conditions a complete

Chamberlin weather strip installation keeps out from 85 to 95% of the air which would leak thru the sash of a window not weather stripped.

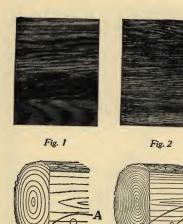


and Inside Door Bottoms

Chamberlin Inside Door Bottoms enable you to admit fresh air to bedrooms or any part of the house while sealing all other parts against draughts. Thus while you sleep with open windows, the other part of the house is not chilled. Operate automatically when fitted to either outside or inside doors. Do not interfere with rugs. Inexpensive to install, separately or in conjunction with Chamberlin Metal Weather Strips.

Chamberlin Metal Weather Strip Company , Detroit, Michigan

Chamberlin Metal Weather Strip Co. 1644 W. Lafayette Blvd., Detroit, Mich. Please send me copy of illustrated booklet. Also, an estimate covering the cost of installing (check which) Chamberlin Inside Door Bottoms...Chamberlin Metal Weather Strips in my Home—Number of Windows...Number of Doors.... Name..... Address ..... Eng. Dept. 100



The illustrations above show the effect of timber growth upon flooring. Fast growth causes wide annular growth rings (A) whit h in turn produce the coarse grain (B). This is tupical of much of the flooring sold today as illustrated in (Fig. 1).

On the other hand, slow growth, which depends upon favorable climatic, soil and drainage conditions, results in close annular growth rings (C) which produce close, fine grain (D) characteristic of flooring made of Appalachian Highland Oak. (Fig. 2).

Just how grain influences the beauty of the finished floor can be seen by observing the two panels of flooring above. The one to the left is coarse and flashy in grain and is spotted in color. The one to the right has fine, close grain, and color is evenly distributed.

### Reasons for the Greater Beauty of Appalachian Oak

By the Research Department of the W. M. Ritter Lumber Company.

F LOOR beauty is largely a matter of timber growth. Granted that the

LOOR beauty is largely a matter of timber growth. Granted that the flooring is well manufactured, properly handled, and well laid, the charm of the completed floor goes back to the forests from which the timber originates.

How appropriate the timber is depends principally on where it was grown. Oak grown under less favorable conditions, although suitable where strength is of prime importance, is not satisfactory for purposes of beauty because of its coarse, flashy grain and uneven texture, due to fast growth and the resultant wide growth rings.

On the other hand, Highland Oak, particularly that from the Appalachian Region, grows slowly and uniformly into timber with fine grain, close, even texture and uniform color—qualities so essential to the truly beautiful floor. These characteristics are due to slow growth and are dependent upon favorable climatic, soil and drainage conditions which are found in upland hardwood timber areas.

Inadequate to Specify Grade Only

### Inadequate to Specify Grade Only

Inadequate to Specify Grade Only

In the standard rules for grading flooring, consideration is given to such imperfections as knots, worm holes, sap, splits and similar defects, but consideration is not given to grain, color and texture. Therefore, to be assured of satisfactory results, it is necessary to specify, in addition to the grade desired, that the flooring be manufactured of Appalachian Highland Oak. The easiest and surest way is to ask for Ritter Appalachian Oak Flooring. way is to a Oak Flooring.

### Explanation of Grade Names

Do not confuse the names used in grading flooring. "Clear" is the best grade and is recommended where the finest quality is desired. "Select" is the next best grade. If you desire to combine economy with beauty specify "Ritter Appalachian Oak, Clear Grade" for first floor rooms and "Ritter Appalachian Oak, Select Grade" for the upper floors.



There is a Difference in Oak Flooring

(Be careful before, instead of sorry after you build)



AILURE to exercise care in the se-lection of a good brand of Oak Flooring for your home will result in a daily reminder, after its completion, of the mistake made.

In this age of homes beautiful—where plans are carefully decided upon, appointments selected with care, and each unit of home embellishment chosen to harmonize with, and enrich the whole—you cannot afford to sound a false note in your decorative scheme by indifferent selection of your Oak Flooring. Sharp differences in the character of the various brands make it really necessary to discriminate.

The floors of the home can make or mar the effect of the entire decorative scheme. Cor-

rect—they give charm and individuality, and enhance its value; lacking qualities essential to floor beauty they detract as much.

Timber grown in the highlands, particularly in the Appalachian Region, possesses precisely the qualities which make for beautiful floorsfine grain, even texture and uniform color. But few of the many brands of flooring on the market today are made from such timber.

That is why discriminating architects and home builders are specifying millions of feet of Ritter Appalachian Oak Flooring yearly. They have learned that beautiful floors are largely a matter of timber growth and that Ritter Flooring is manufactured only from Appalachian Highland timber. Through its use they invariably obtain satisfactory results.

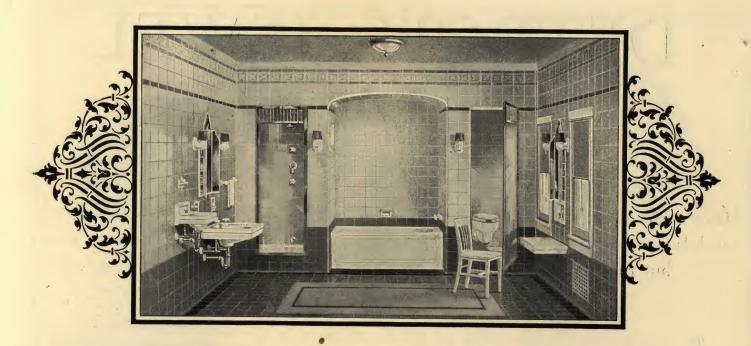
Ask your architect to write Ritter Appalachian Oak Flooring into his specifications. It is branded on the back to

prevent substitution and its use will assure the beautiful floors your home deserves.

W. M. RITTER LUMBER COMPANY, America's Largest Producer of Hardwoods GENERAL OFFICES, 115 E. RICH STREET, COLUMBUS, OHIO

M AITTER LER C





### Compare the Bathroom Fixtures You Select with TE-PE-CO



N all things made by human hands there is standard of excellence with which we make comparisons. In plumbing fixtures it is "Te-pe-co."

Take any standpoint you want — beauty, luxury, sanitation or durability — and you find that Te-pe-co concedes nothing on any point.

From a battery of factory washstands to the most luxurious of modern bathroom appointments Te-pe-co two-fire vitreous china fixtures are represented by a variety of designs and prices that meet the most critical tastes, yet comply with modest appropriations.

Send for our interesting plan book "Bathrooms of Character.'

## PLUMBING ALL-CLAY

TRENTON POTTERIES COMPANY

Trenton, N. J., U. S. A.

Boston

New York

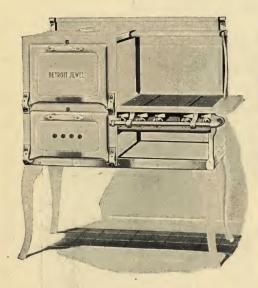
San Francisco

FIXTURES

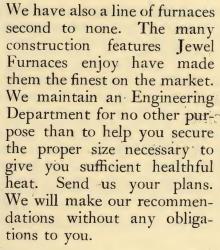
# DETROIT JEWEL GAS RANGES

"They Bake Better"

WE are showing you on this page a few of the many Detroit Jewel Gas Range models we are offering for 1926. Lack of space prevents our showing more but the three samples shown will give you a comprehensive idea of the attractiveness of the Detroit Jewel line.



Our gas ranges are made in three different sizes to fit various kitchens and in a variety of styles to suit different tastes. Write us for a circular of Detroit Jewel Gas Ranges, showing our various models. We always welcome an opportunity to assist in selecting the range suitable to your home.





A letter or card will receive a courteous, prompt reply which we hope will be of service to you.





### DETROIT STOVE WORKS

Largest Stove and Furnace Plant in the World

DETROIT

NEW YORK

**PHILADELPHIA** 

CLEVELAND

CHICAGO



### Douglas Fir and Southern Pine

Douglas Fir and Southern Pine lumber and timbers bearing the Long-Bell trade-mark are carefully manufactured. Long-Bell manufacturing plants at Long-wiew, Washington, are producing Douglas Fir lumber in large volume. Dependable uniformity is the outstanding qualification of Long-Bell trade-marked lumber.



### The Value of This Trade-Mark

of This Trade-Mark
The trade-mark on all Long-Bell products is a means of identifying to you the manufacturer who takes particular pride in producting lumber products having maximum building value. Certain production safeguards help to place this value in lumber during production. The Long-Bell trademark on the end of the piece is your assurance of actual construction value—the assurance of an organization with 50 years of experience behind it.



### A Beautiful Floor Be Certain of It!

A beautiful, well-built oak floor is the combination of a reputable floor layer's skill and good oak flooring. Long-Bell trade-marked oak flooring is unsurpassed in its perfection of manufacture, which enables the floor layer to build a better floor and one that will be satisfactory now and in the years to come. Write us for the booklet "The Perfect Floor"—a valuable and practical booklet on this subject.





## Approved by Contractors and Builders

AREFUL manufacture has given Long-Bell trade-marked lumber a distinctive place in the opinions of contractors and builders, many of whom point to its economy as the reason for their choice.

The professional builder *knows* lumber. He is experienced. Every day he sees the importance of having good lumber on the job, not only that he may avoid the excessive labor costs that result from using inferior lumber, but so that the building may hold its value as the years pass.

Good lumber is an investment of no small importance to the builder and the owner.

"My average \$9,000 home will cost about \$1,600 for carpenter labor," says

Ernest Peterson, a Rockford, Ill., contractor of long experience. "Figuring conservatively, I save \$130 on each house by using Long-Bell lumber, which requires a minimum of the sorting, rehandling and re-manufacturing on the job necessary with inferior lumber."

Similar is the experience of Glen Pierce, a contractor of Ionia, Mich., who says: "I use Long-Bell lumber because it is a dependable, high grade product, which effects important savings for my clients and me."

"My experience with Long-Bell Lumber," declares E. E. Brink of Kankakee, Ill., "has proved its superiority—not only to me but also to my clients and to other local contractors. I prefer it and specify it on all jobs. It is standard with me."

So would run the statements of many contractors who prefer Long-Bell trademarked lumber. It is this proof, the result of actual experience, that recommends Long-Bell lumber so highly to all builders and contractors.

Ask your retail lumber dealer

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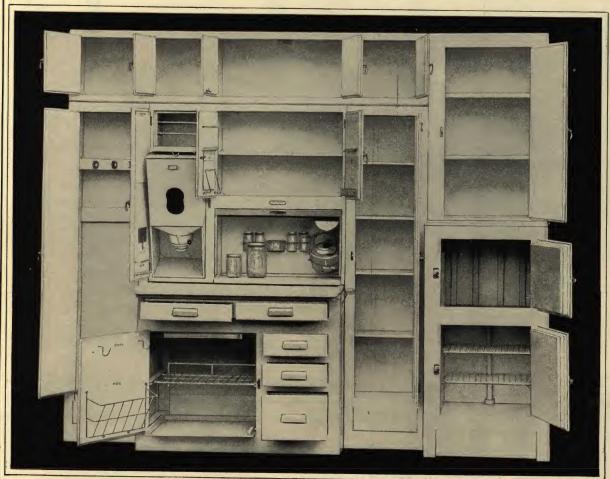
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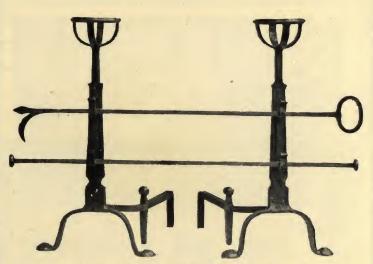
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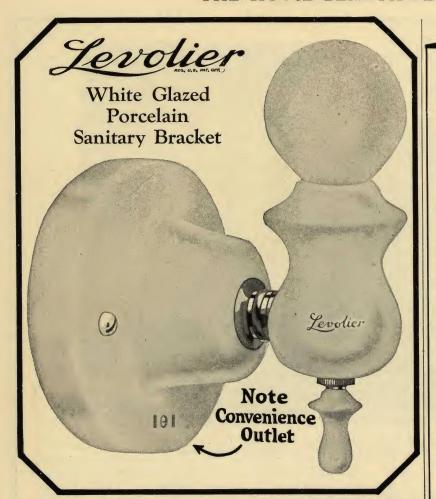
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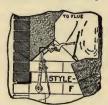
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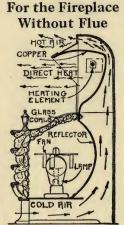
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can be lengthened so that damper can be set as high

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By ALICE VAN LEER CARRICK

WHEN one reads Mrs. Carrick's book, one is almost appalled by two things; first, her tremendous knowledge of antiques; second, her skill in writing so delightfully about the said antiques.

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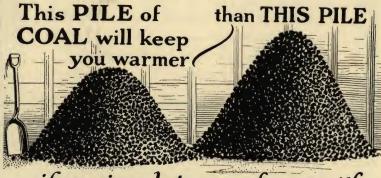
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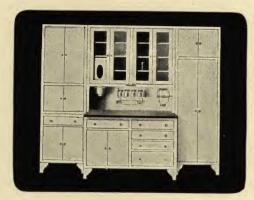


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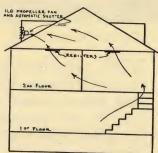
 $A^{\rm NYTHING}$ , whether it be griddle cakes, steak and onions, cabbage, sauerkraut, cauliflower, or fish can be cooked without a suggestion of it in other parts of the house.

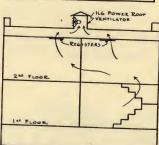
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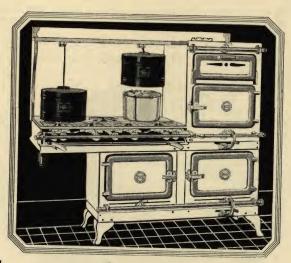
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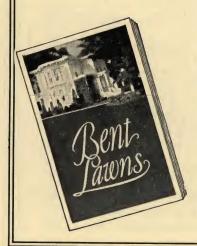


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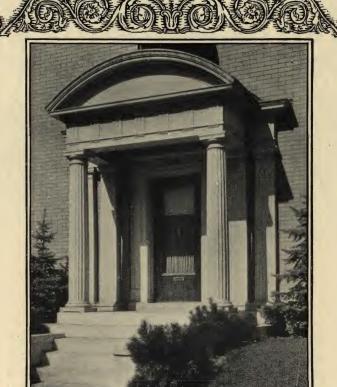
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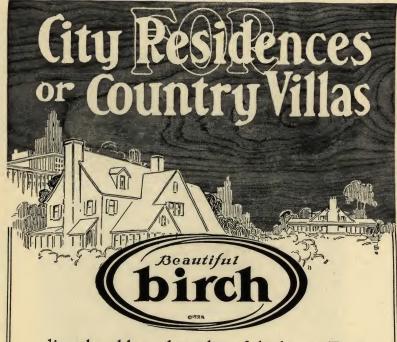
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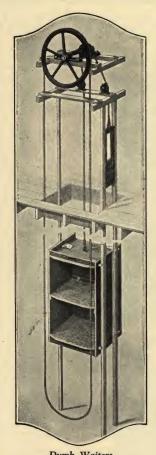
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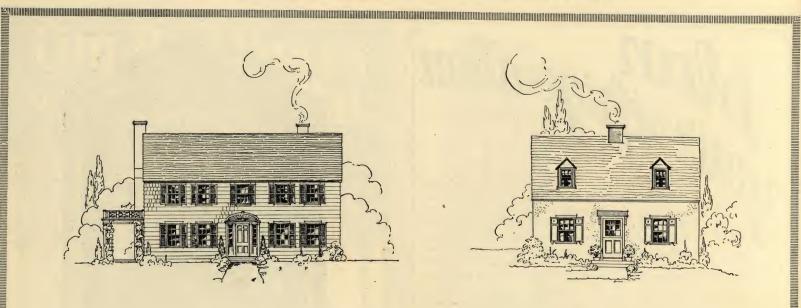
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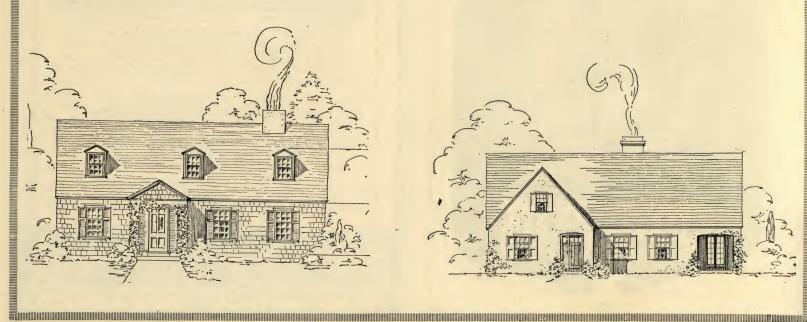
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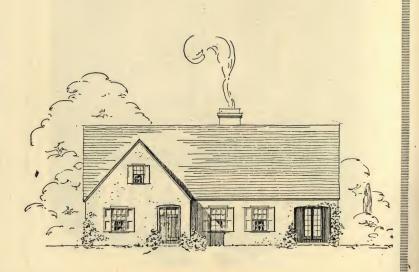
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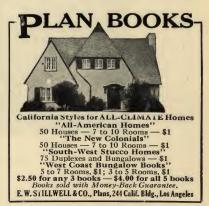
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COVERINGS.
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